Babcock & Wilcox
a Mc Dermott Company

Power Generation Group
20 S. Van Buren Avenue
P.O. Box 351
Barberton, OH 44203-0351
(330) 753-4511

Mr. Phong Do, Plant Engineer
Intermountain Power Service Corporation
850 West Brushwellman Road
Delta, Utah 84624-9546

June 15, 1998

Dear Phong,

Enclosed are four copies of the Rotating/Stationary Throat Comparison Report which covers the testing during the week of March 9-12, 1998. Please feel free to distribute these to Garry Christianson, Jim Nelson, and whoever else you feel should have a copy.

On behalf of the test crew and all other involved B&W parties, I would like to thank you and the other plant personnel we worked with throughout this project. I would also like to apologize for the length of time it took to finish this report.

We believe that if the recommendations stated in this report are implemented, your plant will be very satisfied with the rotating throats on the existing two mills and all future mills.

Please review this report and contact us if any questions arise.

Best regards,

Noel S. Moen

Noel S. Moen
Babcock & Wilcox
Pulverizer Design
(330) 860-2116

cc:
John Doyle, Denver Sales
Frank McGinley, Denver Service
Bob Wewer, Denver Service
Greg Kirk, Portland Service
Jeff Pugh, BWSC Marketing
Steve Bryk, BWSC Marketing
Don Dougan, Pulverizer Design
Sam Allison, Pulverizer Design
Tom Henning, Pulverizer Design
RB-614/615 files

Rotating/Stationary Throat Test Report

Intermountain Power - Delta, Utah

Mills 2B & 2H

March 9-12, 1998

written by: NS Moen
Babcock & Wilcox Co.
June, 1998

EXECUTIVE SUMMARY

After two B&W rotating throats have been installed, the plant is satisfied with the low wear rates on the throats, but have questioned the performance. The plant had stated that the pressure drop of mills equipped with rotating throats was 1-2" higher at 70% feeder speed, and at least 5-7" higher at 95% feeder speed or with "bad" coal, and that these two mills would reject coal, load up and accumulate sand easier than mills with stationary throats. The purpose of the test was to compare the performance mills equipped with these different throats, done with both "good" and "bad" coal (defined as having large amounts of rock present in the raw feed).

The existing primary air calibration "K" factor loaded into the control system is approximately 8900, periodically checked by primary air duct traverse with a Feicheimer probe. This value does not correlate with the burner pipe method used during the week, with mill 2B showing a three-test average of 9698 and 2H with 9679. The lower value in the controls would call for more primary air differential for a required air flow setpoint, thus increasing the actual air flow through the entire primary air system. During the 95% feeder speed tests with "good" coal on 2H, the primary air flow was successfully reduced from 264,108 #/hr to 224,500 #/hr without rejects occurring, lowering the primary air damper position from 93.2% open to 80.9% open, and increasing the mill inlet temperature from 364^{0}F to 390^{0}F (using less tempering air usually results in better boiler efficiency). However, due to the excessive rejects on 2B caused by stationary throat wear, the mills equipped with stationary throats would have to run with positive air flow bias.

The clean air and performance tests on both mills showed that the existing control room indication of mill differential is affected by a combination of throat design, ductwork obstructions and low damper positions. When the K60 (windbox side tap) is substituted for K61 as the high side of mill differential, the clean air and operational plots of mill differential follow more closely with expected results (refer to figures 1-7 through 1-9 and figure 2-18). Using the alternate mill differential as a more accurate measure, the 2H mill differential was not 1-2" higher than the stationary throat, but only 0.1" higher at 70% feeder speed, with comparable fineness and rejects rate. At 95%, mill 2H mill differential was not 5-7" higher, but higher by only 1.2"w.c.. Mill 2H fineness would have improved with the successfully proven lower air flow with no rejects. Furthermore, mill 2B with excessive throat wear was rejecting coal heavily, requiring more air flow, which would have increased mill differential and decreased fineness.

During certain conditions of high feeder speeds or "bad" coal, the pulverized coal system's resistance can approach the primary air duct pressure setpoint, thereby forcing the primary air flow dampers beyond their useful control range of approximately 80% open. When this occurs, the plant has experienced instances where the primary air flow may not stay at the desired setpoint, and the mill may load up with a slumping grinding zone fuel bed comprised of a higher concentration of heavy particle accumulation. When adequate primary air duct pressure was supplied during the "bad" coal tests, the rotating throat mill did not accumulate sand, and actually experienced a reduction in heavy particle accumulation at 85% feeder speed after the duct pressure increase (refer to figures 3-1 and 3-2). The alternate mill differential was not 5-7" higher than 2B, but only 2.5" w.c. higher. However, during all tests with lower duct pressure, the mill differential was indeed higher, indicating proof that adequate delivery pressure is required. This inadequate pressure scenario was further proven by observations and duct pressure adjustments on unit one during the March 12, 1998 "bad" coal supply (refer to figures 5-1 and 5-2), and by researching conditions from the January 21&22, 1998 "bad" coal supply (refer to figure 5-3). There exists a large margin in available duct pressure, since the two-speed fans are currently being run on low-speed.

Due to the stationary throat wear after only 10 months in operation, mill 2B was rejecting large amounts of coal, sand and rock at a rate of one-half box every 30 minutes, and should have been operating with more air flow during the "bad" coal test. Mill 2H showed only small amounts of rock rejects, with a handful of rocks every 5 minutes.

The plant should use damper position, alternate mill differential, mill rejects quantity/quality, mill motor power, and primary air mass flow as tools to monitor mill performance on all mills and for all raw fuel supplies. If the primary air damper exceeds 80%, the primary air duct pressure setpoint should be increased to sustain adequate air delivery to the mills while staying below 80% damper opening. This becomes especially important during periods of high rock content, since it was proven that inadequate supply will aggravate sand accumulation.

If adequate air delivery is supplied, accurate mill differential indications used, and rejects rate considered, it is clear that there is no large difference in performance between the two throat designs. When factoring in the higher wear life of the rotating throat, it is indeed the best overall design.

TABLE OF CONTENTS

BACKGROUND

Both boilers at Intermountain Power are equipped with 8 x MPS-89G pulverizers, and these mills were commissioned in 1986 with stationary throats. In June 1989, a B&W "original design" rotating throat, made from very hard wear iron in an inward-tilted, forward oriented casting (CW), was installed in mill "1H". This design suffered from mechanical failures of the thin, brittle flange and it's fasteners. This throat was subsequently removed, and two after-market (CCW) rotating throat designs were tested simultaneously in the "H" mills on both units. Fineness and erosion were a problem on these after-market designs, and since the plant sells over $1 million a year of flyash with a maximum 0.55% unburned carbon in the flyash (UBC), they could not stand for any fineness degradation.

In 1993 and 1994, the plant requested information on B&W's latest rotating throat design philosophy, with emphasis on mechanical reliability and performance equal to the stationary throat. A forward oriented (CW) weldment design was accepted in August 1995, with installation in mill "1H" in June, 1996 (after removal of the Southwestern rotating throat). During this approximate time frame, the plant started to periodically receive coal with large quantities of rock, causing considerable difficulty in keeping up with the rejects on all mills. The roll wheel variable loading system operating pressure was increased from 2100 psig to 2400 psig at higher feeder speeds to help this condition by reducing mill differential with better grinding. During this time, the "1H" mill pressure drop and motor power was still reported higher than other mills equipped with stationary throats. However, fineness was reported higher on mill "1H", which could account for some of the pressure and power increase.

A plant visit on 8/26-29/96 to investigate the high power and pressure drop revealed that all mills at the plant had started accumulating sand over time, requiring periodic removal from service and using large amounts of primary air flow to clean the grinding ring, reducing mill differential by some 4" w.c.. Some alternatives, including the new WearResistor LP™ tire and segment design with flatter profile, were discussed with plant personnel during a meeting that week.

An internal mill inspection on "1H" showed the outer cone directly below the throat to be hanging over the throat ports, allowing raw coal to spill through the ports and become lodged in the housing cavity. This was repaired, and helped to lower the pressure drop.

During this visit, the Sure Alloy System rotating throat in mill "2H" was stated as "worn-out", requiring replacement. Since the initial indications from mill "1H" showed no wear internal to the mill, the plant was interested in resolving the alleged high power and pressure drop issues. After running motor power tests with equal amperage draw and recording higher winding temperature on the "1H" motor, it was agreed that the high winding temperatures were related to the rewound "1H" motor. Therefore, with the power issue apparently resolved, another rotating throat for mill "2H" was ordered, installed and placed in service around August 11,1997. Initial plant feedback advised good fineness, normal power, but pressure drop some 2" w.c. higher and more rejected rock than the stationary throats.

The sand accumulation problem seemed to escalate during August 1997, with unit operation placed in jeopardy on several occasions, including the night of 8/26/97. On 8/27/97, the plant discussed this problem with B&W, and several alternatives, including vacuuming or blowing the sand out as well as the lower profile elements, were discussed. The plant ended up designing a removal system using a high pressure air jet, but their upper management would not approve trial.

In December 1997, the plant contacted B&W to state that both mills equipped with the welded rotating throats were experiencing primary air flow oscillations. These oscillations in air flow would eventually start the mill inlet temperature swinging, and would subsequently upset boiler combustion, drum pressure, and eventually turbine throttle pressure. At 70% feeder speed, the mill differential was reported to be 2" w.c. higher than stationary throats (14" vs. 12"), but would become significantly higher at higher feeder speeds or during days when the amount of rock in the raw feed was high. This mill differential would approach 30" w.c., and would subsequently cause the mill to start "choking", causing non-uniform fuel feed to the boiler and thereby upset boiler steam pressure. At that time, a suggestion was given to the plant to try raising the primary air duct pressure during these instances of mill choking to investigate whether adequate supply of primary air is available. This was not tried by the plant.

In January 1998, high mill differential and boiler upsets were still problems, but both mills with rotating throats were reported producing between 4-10% higher 200 mesh fineness than the mills with stationary throats. Due to the excellent wear characteristics of the rotating throat, the plant was convinced of it's merits over the stationary throat, but inquired about a reverse vane (CCW) throat and our comments on predicted fineness and pressure drop of such design. We stated that although the pressure drop would be lower, our experience has been that the CW throats tend to yield better fineness.

TEST OBJECTIVES

Due to these plant concerns on pressure drop and boiler stability, along with B&W's desire to test these throats, an agreed test procedure was formed with the following plant objectives developed:

1) Verify that the rotating throat mill differential is 1-2" w.c. higher than the fixed throat at 70% feeder speed and at low rock/fuel ratio, and 5-7" w.c. higher at 95% feeder speed and higher rock/fuel ratio.

2) Verify that mills equipped with rotating throats dribble and load up easier at high rock/fuel ratio due to possible grinding zone recirculation.

3) Compare mill performance (power, stator temperature, fineness and rejects rate) between the two throats at 70% and 95% feeder speed and at higher rock/fuel ratio.

4) Determine the root causes and their solutions.

TEST PROCEDURE

During the week of March 9-13, 1998, GN Kirk of B&W Portland Service assisted DR Dougan and NS Moen of B&W Pulverizer Design in the inspection, repair, clean air calibration and mill performance testing on both mill "2B", equipped with a stationary throat, and mill "2H", equipped with a welded CW rotating throat. The planned procedure was to ensure both mills were in the same mechanical shape by performing an inspection and making any neccessary adjustments/replacements that would affect mill performance. Then, both mills would be checked by performing a primary air calibration at three air flows by means of a burner pipe pitot tube traverse (the plant usually does this calibration with a Feicheimer probe traverse of the mill inlet duct during operation). After calibration, both mills would be tested in operation with low rock/fuel ratios at the ends of their operating range (70 and 95% feeder speeds). Both raw and pulverized coal samples would be collected, along with control room and field data including motor power; primary air, mill and classifier ΔP; primary air static pressure at the throat inlet, pitot tubes, and supply duct; damper position; and observed mill operation (rejects rate/composition and smooth/rough operation). After this, both mills would be observed while operating with high rock/fuel ratios.

Upon arrival, a meeting was held 3/9/98 AM with numerous plant personnel to discuss the test procedure, but also covered other topics and problems:

- CW rotating throats appear more sensitive to sand buildup than stationary throats
- boiler upset excursions occur when mill ΔP increases to 28-30" w.c.
- normal mill ΔP is in the 15" w.c. range with low rock/fuel ratios
- increasing roll wheel loading does not necessarily solve the problem
- there appears to be no relation between grinding element wear life and sand

accumulation (it doesn't get worse when the track wears)

- maintenance claims that since the variable roll wheel loading was installed, more wear is noticed on the outer edge of the grinding ring segments
- Since the plant is able to sell over $1 million per year in flyash with less than 0.55% UBC, the plant feels that fineness cannot degrade. They are typically in the 99.7%/50 mesh range.

MILL "2B" INSPECTION/CALIBRATION

After the meeting, the small door on mill "2B" was opened for inspection. This mill had been rebuilt in May 1997 (approximately 10 months old) with new tires, new wear plates, new upper stationary throat segments, new ledge covers, new classifier vanes, and weld-repaired grinding ring segments. During inspection, the following items were noted:

- one classifier discharge door was hanging open - this door was replaced
- there were large sections of the ring seat seal severely worn or missing
- the upper throat segment vanes were worn very thin on the O.D. between the three tires, but not as much behind the tires
- one area of the lower throat had a large hole in the inner wall
- the ledge cover nose had completely worn off in areas behind the roll wheels, making these ledge covers exhibit an almost vertical wall
- the upper roll wheel wear brackets were severely worn around the lifting ears, facing the forward angle throat (being directly blasted by the flow)
- the pivot blocks and pins showed extreme wear, with some of the blocks touching each other, and some with cracked ends
- the housing wear plates showed considerable wear for 10 months' service
- wear evident on the anti-torque bars and housing retainers (previously repaired)
- the classifier vanes were in good shape with 19 ¾" total length, but were installed on the "front" side of the fixed vane (incorrect), resulting in an approximate 6" vane tip clearance
- there was no extraordinary wear on the ring segment ears
- springs measured 22 ¾" - 23 ½" with 860 psig loading pressure
- loading cylinder "B" dimensions were 33 ¾", 36 ⅜", and 36 ¾" in a CW direction starting with the cylinder closest to the right side of the primary air duct and ending with the cylinder near the mill maintenance isle

The mill was closed, tags pulled, and the primary air calibration done at 80, 90, and 100% indicated air flow in the control room, commencing at 1743 hours and ending at 2035 hours on 3/9/98. All six burner lines were traversed with a Dwyer pitot tube. The data from the three clean air tests is found in figures 1-1 through 1-3. The primary air calibration factor ("K" factor) was calculated to be 9786, 9733, and 9576, for an average of 9698. This compares to a "K" factor of approximately 8900 currently loaded into the control system, with the plant controls calling for approximately 9% higher actual flow. The plant was given the mill back for their use, and were requested that mill "2H" be taken off line, tagged, cooled, opened and cleaned for a morning inspection.

MILL "2H" INSPECTION/CALIBRATION

The small door on mill "2H" was opened for inspection in the AM of 3/10/98. This mill had been rebuilt in August 1997 (approximately 7 months old) with new tires, new wear plates, new welded rotating throat, ledge covers, and new grinding ring segments. During inspection, the following items were noted:

- one classifier discharge door was missing, and two were hanging open or binding- these doors were replaced (see figures 4-3 and 4-4).
- there was a hole in the side of one discharge hopper and was fixed (see figure 4-5).
- there was one broken wear plate opposite the small access door, and a piece of this wear plate had become jammed in a rotating throat port (see figures 4-6 and 4-7).
- the rotating throat segments showed virtually no wear (see figures 4-8 thru 4-10).
- the ledge cover nose showed very little wear, with only a small amount of laning
- the wear plates were showing tapered wear, as a result of the pressure frame shifted ½" in the CW rotation (downstream of the housing wear plates)
- the pivot blocks and pins showed little wear
- all three roll wheel seal air pipes were loose, with air flowing from the upper bushing on two of the three pipes
- wear evident on the anti-torque bars and housing retainers (had been previously repaired) (see figure 4-11).
- the classifier vanes were in good shape with 19⅞" total length, and were installed on the "back" side of the fixed vane (correct), resulting in an approximate 7" vane tip clearance
- the classifier upper plate showed signs of heavy erosion around the vane tips (see figure 4-12).
- the lower pyrites plow wear plate was almost completely worn off, and there was approximately 8" of sand in the windbox due to the worn plow (see figure 4-13).
- on certain areas of the throat's inner cone, 1" long vertical cracks were seen propogating downward from the cone attachment weld to the lower edge of the inner wall of the throat segment (see figure 4-14).
- springs measured 22¾" - 23¼" with 920 psig loading pressure
- loading cylinder "B" dimensions were 36⅛", 36⅜", and 35½" in a CW direction starting with the cylinder closest to the right side of the primary air duct and ending with the cylinder near the mill maintenance isle

The mill was closed and tags pulled. After numerous delays to retrofit the feeder with a new electronic measuring device, the primary air calibration (done at 80, 90, and 100% indicated air flow in the control room) commenced at 1715 hours and ended at 2015 hours on 3/10/98. All six burner lines were traversed with a Dwyer pitot tube. The data from the three clean air tests is found in figures 1-4 through 1-6. The primary air calibration factor ("K" factor) was calculated to be 9615, 9736, and 9686, for an average of 9679. This compares to a "K" factor of approximately 8900 currently loaded into the control system, or a difference of approximately 9% higher actual flow.

CLEAN AIR DISCUSSION

During the last few years of pulverizer testing, B&W has noticed differences in indicated mill differential, comparing the original method of measurement against an alternate method. Our original method uses a static pressure tap on the top of the primary air inlet transition (actually part of the mill's lower housing) designated as K61 on contract outline drawings for the high side of mill differential (reference figure 4-1). Our alternate method uses a static pressure tap on the side of the mill windbox as the high side of mill differential. This tap is designated as K60 on contract outline drawings (reference figure 4-1). The primary air inlet transition has become "heavily populated" with numerous items over the years of MPS design and evolution. Some of these devices are simply stiffening gussets for explosion strength, but others include the addition of a steam inerting header. To stay away from the inerting header, the K61 pressure tap is normally located towards the side of the inlet transition. On some mills, the measured static pressure of this K61 high side pressure tap can also be affected by elements such as a throttled flow control damper in close proximity, or by maldistribution in the feeder duct. The effect of these conditions tends to affect this K61 tap in some instances, thereby skewing this static pressure reading and subsequently affecting the indicated mill differential. This is always evident when plotting the mill's clean air data and finding that the plots do not follow the basic rules of flow dynamics for correct test conditions when using transmitter sensing lines with no leaks:

- a plot of primary air vs. mill differential data should form a straight line and pass through the origin
- a log-log plot of air flow rate vs. differential should be straight lines with 27-30^0 slope

The clean air data plots of primary air vs. K61 mill differential from both "2B" and "2H" mills are shown in figure 1-7. Note that prior to the testing, these transmitters and sensing lines were checked for calibration and leaks by plant personnel. As noted by the plots of primary air differential against the original K61 mill differential, the "2B" plot is not straight, and both "2H" and "2B" plots do not pass through the origin. Figure 1-8 shows the plot of the same primary air differential against the alternate mill differential, using K60 as the inlet static instead of K61. Note that both plots in figure 1-8 are straight, and come much closer to passing through the origin. When analyzing a log-log plot of mill differential vs. mill inlet CFM for both mills' original and alternate mill differential, found on figure 1-9, it is clear that both alternate plots, using the K60 as inlet pressure, represent mill differential better than the original mill differential plots that use K61 as inlet pressure. It is also evident that as mill inlet CFM increases, along with an increasing damper position, the plots of original mill differential appear to converge closer to the alternate mill differential plots, suggesting that at some high flow and damper position, these two may essentially be the same. It also appears that for a given mill inlet CFM, mill "2B" has a slightly higher alternate mill differential. This would seem reasonable, since the throat area at it's pinchpoint is slightly smaller than mill "2H". Both mill plots of alternate mill differential are within the acceptable range (27-30^0 slope). Other log-log plots showing primary air differential against measured mill inlet CFM (figure 1-10) and classifier differential against mill outlet CFM (figure 1-11) appear to show good representation of actual values. For both mills, the very close relation between primary air flow and primary air differential indicates a "K" factor essentially the same for both mills, shown on figure 1-10. Additionally, figure 1-11 shows the close relationship between classifier differential against outlet CFM for both mills, indicating the classifiers to be closely set.

The two average "K" factors of 9698 and 9679 on mills 2B and 2H respectively show good consistency amongst themselves. However, they do not correlate with the numbers currently in the control system, done with a Feicheimer probe by traversing the primary air duct. Other instances have shown that duct traverses are very sensitive to flow conditions, and flow conditions are sensitive to obstructions and bends. This difference in K factor between the two calibration methods represents a difference in air flow of approximately 9%, meaning the current K factor of 8900 calls for higher actual air flow. The reduction of this 9% air flow would have a positive effect on mill fineness, but would probably not be possible on any mills currently equipped with worn stationary throats due to their tendency to wear. However, any mill equipped with a rotating throat would benefit from operating with the lower air flow without rejects, producing higher fineness, lower erosion, lower damper positions, and utilizing more hot air, producing a positive effect on boiler efficiency.

The standard method of mill control is usually based on measuring both coal and air (mass) flow and assigning a loading curve that has a given fuel/air ratio for given output ratios. The output ratio is corrected for fineness requirements and raw coal parameters covering moisture and grindability. Each individual mill is calibrated by traversing all burner pipes with a pitot tube, and all mills assigned the same K factors by fine-tuning the averaging pitot tubes in the primary air ductwork with either an obstruction dam or by rotating the averaging pitot tubes.

The existing method of mill control in the plant is based on coal flow/ feeder speed and air flow requirements in volume flow, with all mills having a different transmitter range to give a maximum air flow of 71,400 CFM. The air is temperature compensated to 350°F. Primary air calibration has typically been done by Feicheimer traverse in the primary air duct. Individual mills are fine-tuned by adjusting each individual primary air transmitter range. Past experience has taught that caution should be used in this calibration procedure, since damper and other flow unbalances can skew the ductwork readings and subsequently the K factor. In general, there is more potential for mistakes when using the duct traverse vs. the burner pipe traverse, and there is no way to check the individual burner pipe distribution when using a duct traverse. However, if the duct conditions are consistent, there is no reason that a burner pipe traverse could not be correlated with the Feicheimer traverse to achieve consistent air calibration values and reap the benefit of calibration by duct traverse by not requiring the mill to be out of service for air calibration.

Typically, using mass flow as a control for primary air is viewed as a more sensitive method, compared to using either percent of maximum, or using a volume flow. Since mass flow is already calculated in the PI system and identified as 2SGBPX1090 and 1096 for 2B and 2H weight flow in pounds per minute, respectively, it is recommended that this mass air flow parameter is used for air flow control on the mill loading curve. The recommended mill loading curve is found on figure 2-17, designated as the MPS-89G standard for the conditions of HGI and atmospheric pressure typical at the Intermountain plant. The mills could be set to run on this curve, but mills equipped with worn stationary throats may not be able to run on this curve without bias.

MILL 2B PERFORMANCE TESTS ON "GOOD COAL"

Mill performance tests were conducted on mill "2B" starting at 1030 hours on 3/11/98 for approximately one hour duration with the first test at 70% feeder speed (96,000 #/hr) and no air flow bias while running on the current control curve. This data is shown on figure 2-1. Since the tested calibration factor ("K" factor) was different than the current control factor, the indicated air flow (201,600 #/hr) was less than actual air flow (227,426 #/hr), differing by 12.8%. The primary air duct pressure was being controlled at 43.2" static, and the primary air flow damper position was 65.7% open. The indicated mill differential (original) in the control room read an average 11.5"ΔP, where the same measurement with a rack manometer was 11.05" ΔP average. The alternate mill differential (K60-K62), measured with a manometer, indicated 14.9" ΔP. Classifier differential measured 5.4"ΔP, and motor input power was measured at 586.3 KW with a Dranetz power meter. The roll wheel loading pressure was at 2150 psig, which equates to approximately 25 tons per roll. The mill operation was smooth, with no rejects of coal or rock. Both raw and pulverized coal samples were taken, with the plant's lab crushing and splitting all of the raw coal sample for distribution between IPSC and B&W. The plant's grindability test showed the coal to have a 48.9 HGI. Fineness samples were taken in all of the six pipes with the plant's ASME sampler, and the mill's recovery rate checked and adjusted by aspirating with 7" w.c. air pressure, yielding 98.84% recovery. The plant's sieve analysis for fineness (reference figure 2-2) yielded 99.8%, 98.5%, and 79.8% through 50, 100, and 200 mesh screens, respectively. A separate sieve analysis by B&W was conducted and is shown on figure 2-2 as well, with fineness of 99.94%/99.86%/98.98%/93.1%/80.7% passing the 50/70/100/140/200 mesh screens, respectively.

The feeder speed was then increased to 85% (116,000 #/hr) with no air flow bias to collect field and control room data only (no coal samples). Data from this test is shown on figure 2-3, run from 1240 hours to 1315 hours. The indicated air flow (216,000 #/hr) was less than actual air flow (244,517 #/hr), differing by 13.2%. The primary air flow damper position increased to 74.2%. The indicated mill differential (original) in the control room read an average 15.0"ΔP, where the same measurement with a rack manometer was 15.9" ΔP average. The alternate mill differential (K60-K62), measured with a manometer, indicated 18.7" ΔP. Classifier differential measured 5.9"ΔP, and motor input power was measured at 615.1 KW with the power meter. The roll wheel loading pressure was at the maximum 2400 psig, which equates to approximately 28 tons per roll. The mill operation remained smooth with no rejects of coal or rock.

The feeder speed was then increased to 95% (128,520 #/hr) with no air flow bias. The test spanned from 1340 hours to 1430 hours and is shown on figure 2-4. The indicated air flow (231,540 #/hr) was less than actual air flow (260,875 #/hr), differing by 13.2%. With the same primary air duct pressure setpoint of 43.2" static pressure, the primary air flow damper position was 100%. The indicated mill differential (original) in the control room read an average 22.5"ΔP, where the same measurement with a rack manometer was 22.45" ΔP average. The alternate mill differential (K60-K62), measured with a manometer, measured 22.8" ΔP (these three tests prove that the damper position does have an affect on the control room's indicated mill differential readings). Classifier differential measured 6.7"ΔP, and motor input power was measured at 651.7 KW with the power meter. The roll wheel loading pressure was at the maximum 2400 psig, which equates to approximately 28 tons per roll. The mill operation remained smooth, but accumulated large amounts of rejects, filling one-half of the pyrites box in ten minutes time. Both raw and pulverized coal samples were taken, with the plant's lab crushing and splitting all of the raw coal sample for distribution between IPSC and B&W. The plant's grindability test showed the coal to have a 43.8 HGI. Fineness samples were taken in all of the six pipes with the plant's ASME sampler, and the mill's recovery rate checked and adjusted by aspirating with 6.5" w.c. air pressure, yielding 91.75% recovery. The plant's analysis for fineness (reference figure 2-5) yielded 99.6%, 97.2%, and 74.8% through 50, 100, and 200 mesh screens, respectively. B&W's analysis of the sample yielded 99.98%/99.78%/97.98%/89.72%/76.04% passing through 50/70/100/140/200 mesh sieves, respectively. Based on our standard raw coal correction for HGI, the mill would be at 107.8% output ratio, and predicted 200 mesh fineness would be approximately 65%/200 mesh. Obviously, the mill appears to be doing well on fineness, but the excessive amount of coal rejects (one-half box per ten minutes) is unacceptable, and would therefore demand more air flow, which would subsequently lower the fineness.

The indicated coal flow, mill differential and air flow, with damper position, duct pressure and feeder speed for the three performance tests are all shown in figure 2-6. Figure 2-7 represents data from the plant pertaining to the three tests.

MILL 2H PERFORMANCE TESTS ON "GOOD COAL"

Mill performance tests were conducted on mill "2H" starting at 1545 hours on 3/11/98 for approximately one-half hour duration with the first test at 70% feeder speed (96,000 #/hr) and no air flow bias while running on the current control curve. This test data is found on figure 2-8. Since the tested calibration factor ("K" factor) was different than the current control factor, the indicated air flow (205,200 #/hr) was less than actual air flow (235,468 #/hr), differing by 14.7%. With the primary air duct pressure setpoint of approximately 43.6", the primary air flow damper position was 73.4%. The indicated mill differential (original) in the control room read an average 14.0"ΔP, where the same measurement with a rack manometer was 13.0" ΔP average. The alternate mill differential (K60-K62), measured with a manometer, indicated 15.0" ΔP. Classifier differential measured 5.4"ΔP, and motor input power was measured at 592.2 KW with the Dranetz power meter. The roll wheel loading pressure was at 2100 psig, which equates to approximately 24.5 tons per roll. The mill operation was rough, with an intermittent rumbling heard down by the mill (this could have been caused by the shifted pressure frame as explained in the inspection section of this report). There was one rock being rejected every 15 seconds, with a small amount of 1/16" coal. Both raw and pulverized coal samples were taken, with the plant's lab crushing and splitting all of the raw coal sample between IPSC and B&W. The plant's grindability test showed the coal to have a 49.1 HGI. Fineness samples were taken in five of the six pipes with the plant's ASME sampler, and the mill's recovery rate checked and adjusted by aspirating with 3-4.5" w.c. air pressure, yielding 103.4% recovery. The plant's analysis for fineness (reference figure 2-9) yielded 99.4%, 98.3%, and 77.6% through 50, 100, and 200 mesh screens, respectively, whereas the B&W analysis yielded 99.88%/99.68%/98.62%/92.1%/79.42% through 50/70/100/140/200 mesh sieves.

The feeder speed was then increased to 85% (116,000 #/hr) with no air flow bias to collect field and control room data only (no coal samples). This test was run from 1645 hours to 1730 hours with the data on figure 2-10. The indicated air flow (221,400 #/hr) was less than actual air flow (249,706 #/hr), differing by 12.7%. With the primary air duct pressure setpoint at approximately 43.8" static, the flow control damper was at 81.3% open. The indicated mill differential (original) in the control room read an average 16.0"ΔP, where the same measurement with a rack manometer was 16.1" ΔP average. The alternate mill differential (K60-K62), measured with a manometer, indicated 18.1" ΔP. Classifier differential measured 6.3"ΔP, and motor input power was measured at 618.1 KW with the power meter. The roll wheel loading pressure was at the maximum 2400 psig, which equates to approximately 28 tons per roll. The mill operation was smooth, with no rumbling. There was one rock present every 15 seconds with no coal being rejected.

The feeder speed was then increased to 95% (130,000 #/hr) with no air flow bias. The test spanned from 1745 hours to 1830 hours, and data presented on figure 2-11. The indicated air flow (234,000 #/hr) was less than actual air flow (264,108 #/hr), differing by 11.4%. With the existing primary air duct pressure setpoint, it was very clear that the damper would require 100% opening, and still would not be capable of carrying the proper air flow to the mill. Note from figures 2-14 and 2-15 that at 1710 hours, the primary air damper went to 100% open. Note that at this time the primary air flow started to drop off. Therefore, the primary air duct pressure setpoint was increased, commencing around 1720 hours, reaching a final setpoint of 47.7" static pressure at 1820 hours. The damper was still at 93.2% open, but flow was stable. The indicated mill differential (original) in the control room read an average 22.9"ΔP, where the same measurement with a rack manometer was 23.1" ΔP average. The alternate mill differential (K60-K62), measured with a manometer, indicated 24.0" ΔP. Classifier differential measured 7.1"ΔP, and motor input power was measured at 603.5 KW with the power meter. The roll wheel loading pressure was at the maximum 2400 psig, which equates to approximately 28 tons per roll. The mill operation remained smooth with some rock and one 1/16" piece of coal every 30 seconds. Both raw and pulverized coal samples were taken, with the plant's lab crushing and splitting all of the raw coal sample between IPSC and B&W. The plant's grindability test showed the coal to have a 46.2 HGI. Fineness samples were taken in five of the six pipes with the plant's ASME sampler, and the mill's recovery rate checked and adjusted by aspirating with 3-4" w.c. air pressure, yielding 102.6% recovery. The plant's analysis for fineness (reference figure 2-12) yielded 99.6%, 95.7%, and 64.8% through 50, 100, and 200 mesh screens, respectively. The B&W analysis yielded 99.98%/99.58%/95.8%/83.32%/66.52% passing 50/70/100/140/200 mesh sieves. Based on a feed rate of 130,000 #/hr of 46.2 HGI coal, the mill throughput ratio is 103.5%, and this throughput ratio would predict approximately 67% 200 mesh fineness. Therefore, this mill equipped with the rotating throat is performing as expected with essentially no rejects other than some rock.

Since there appeared to be an excessive amount of air flow throughout the control range, the feeder speed was held at 95% with primary air placed in manual, reducing the air flow while simultaneously monitoring the pyrites hopper for signs of rejects. This test was run from 1900 to 1930 hours, with the data shown on figure 2-13. The air flow was successfully reduced from 99% (calculated 264,108 #/hr) to 83% (calculated 224,500 #/hr) before some rock and a small quantity and size of raw coal was seen in the pyrites hopper. Control room indicated mill differential stayed at 22.9" ΔP, with the rack manometer reading 23.2" ΔP. The alternate mill differential (K60-K62), measured with a manometer, indicated 24.4" ΔP. Classifier differential decreased to 5.9"ΔP, and motor input power increased to 658 KW with the power meter. The mill inlet temperature also increased from 364°F to 390°F, supporting the lower air/fuel ratio of 1.73 from 2.03:1. Undoubtedly, the mill fineness improved from the previous test with the higher 2.03:1 air/fuel ratio, since power increased, but due to the plant's desire to return the mill to their control, there was no fuel sampling to verify this. The primary air damper only required an opening of 80.9% with the lower air flow, versus the 93.2% opening with the higher air flow.

The indicated mill differential and air flow, with damper position, duct pressure and feeder speed for the three performance tests are all shown in figure 2-14 and 2-15. Figure 2-16 represents data from the plant pertaining to the three tests.

MILL 2B/2H PERFORMANCE COMPARISON

Figure 2-17 compares the measured fuel/air ratio on both mills against the indicated and standard ratio for an MPS-89G with the plant's coal and atmospheric conditions. Note that the indicated air flow corresponds with the recommended air flow, but since the measured K factor is different than the value in the controls, both mills are actually running higher air flow than recommended by the same 12% difference. This has a negative effect on fineness, but due to stationary throat wear and associated coal rejects, it would not be possible to lower the air flow on mills equipped without rotating throats.

Figure 2-18 compares mill differential, and shows that at 95% feeder speed, there is virtually no difference between mills or method of measurement, but at 70% and 85% feeder speed there is a difference between measurement, with the 2H control room indicated mill differential some 2" w.c. higher than that for mill 2B. However, if the alternate mill differential is used, there is no difference in 2H and 2B mill differential even at the lower feeder speeds.

The unreliable measurement of mill differential by using the K61 tap on the top of the primary air duct as the high side is not as consistent as using the K60 tap located on the side of the windbox (reference figure 4-1). This was not only proven during clean air testing, but once again during the performance tests, and is depicted on figure 2-18, showing the difference between the existing method of mill differential measurement compared against the alternate method of mill differential measurement using the K60 tap located on the side of the windbox. Note from the data that as the damper position and flow/static increases in the supply duct (reference the 95% feeder speed numbers), these differences in pressure drop indication decrease, but at the lower feeder speeds, they are affected by the lower values of flow and damper position. Past testing has shown these differences not only attributed to flow and static unbalances but also the vane orientation/rotation of the throat. Since only one mill on each unit is currently equipped with forward angle vane rotating throats, it is recommended that either the K60 or the K13 tap (reference figure 4-1) be used as the high side of mill differential to provide more consistent, relevant and reliable mill differential readings for either clean air measurement or during mill operation on any mill regardless of throat style or design.

THEORY OF OPERATION

In theory, the vertical-spindle pulverizer grinding zone is comprised of both raw feed and partially ground fuel. This condition is analogous to a fluidized bed, supported by the primary air flow sufficient for drying, circulation and transportation without rejecting coal, while at the same time allowing heavier impurities such as rock, pyrites and tramp iron in the raw coal to leave the grinding zone via the throat, windbox, and pyrites removal system. Insufficient air flow may cause "slumping", meaning the grinding zone bed inventory slowly increases to a point of not being properly fluidized by the air below it. In the case of slumping, the mill differential becomes unstable and slowly increases, resulting in non-linear plots of mill differential against coal flow. If mill differential increases to a point where the total system resistance (made up of burner nozzle/pipe, classifier, mill, ductwork, and airheater resistance) approaches the primary air fan supply pressure, the primary air damper will open to compensate by supplying less resistance to flow across the damper. However, past experience has shown that as a flow control damper reaches 80% open, the flow through the damper is close to maximum, and that the incremental increase in flow for the last 20% damper opening is very small. Therefore, any condition that would cause unstable mill differential or slumping of the grinding zone coal bed could certainly upset the system if the flow control damper was already around 80%.

During conditions of high rock/fuel ratios, this bed will generally be higher in density close to the grinding zone, since the rock concentrations increase both the bulk and powder density. This increase in density will usually cause an increase in mill differential, requiring larger damper positions to satisfy pressure and flow requirements. If the damper is already in the 80% range, there is a good chance of crossing into the unstable, slumping bed phenomena, where the natural tendency of the rock to accumulate in the grinding zone (without circulation or egress) will occur. Once this accumulation starts, the condition tends to nourish itself, since the accumulation will subsequently increase the restriction to air flow through the bed. If the condition continues long enough, the rejects rate, mill differential, and motor power will all increase, reflecting the heavier bed with high density particle accumulation, and eventually, the air flow through the mill will be "starved". To prevent this condition, the primary air flow rate must not be allowed to decrease, and to compensate for the higher system resistance, the primary air delivery pressure (usually referred to as the primary air duct pressure) must be increased. Normally, this system is controlled to a static pressure setpoint that may be modulated with either unit load or "highest mill differential" feedback, but ultimately the system must cover conditions like biased mill firing as well. In these special cases, the normal setpoint should be manually biased by the unit operator.

PERFORMANCE TESTS WITH HIGH ROCK/FUEL RATIO

The plant had expressed more difficulty with "H" mills when large amounts of rock was present in the coal, claiming these mills would carry a higher differential and would reportedly accumulate sand faster than the mills with stationary throats. To prove this point, the plant had reserved large amounts of this coal with high rock content, and the plant proceeded to fill the bunkers of both "2H" and "2B" during the early hours of 3/12/98. Upon returning to the plant in the morning, the feeder speeds were at 70% with the primary air duct pressure setpoint of 45.7" static pressure. At that time, mill 2B was experiencing rejects of both rock and coal, but yet at a manageable level. Mill 2H was showing no coal rejects; only rock at this load. The mill 2H primary air damper position was at 83.6%, which did not have much room for a load increase and still be capable of delivering required air flow. Therefore, the primary air duct pressure setpoint was increased in one inch increments from the initial 45.7" value to 49.5" at 1040 hours to prepare the system for the stability tests. The following table shows the effect of higher primary air duct pressure on mill "2H" damper position and mill differential at constant feeder speed of 70%:

Table 1: Effect of Duct Pressure on 2H Mill Performance (70% Feeder Speed)

TIME	FDR SPD	PA DUCT PRESS	2H DMPR,%	2HDIFF., "w.c. (K60-K62)	2H REJECTS
0900	70%	45.7	83.6	23.5	rock only
	"	46	80.4	22.8	"
	"	47	80.1	22.0	"
	"	47.8	79.6	21.5	"
0933	"	48.2		20.5	"

This data with 70% feeder speed and higher is also shown graphically on figure 3-1. From the above table and from figure 3-1, it is evident that an increase in duct pressure with constant feeder speed will certainly result in a decrease in mill differential, with a corresponding decrease in the flow control damper as well. Note that prior to the start of the tests (reference figure 3-1 from 0743 hours to 0900 hours) with 70% feeder speed primary air duct pressure of 45.7" w.c., the 2H mill differential showed signs of slowly increasing due to accumulated high-density material in the grinding zone bed. Also note that while at the constant 70% feeder speed, from 0900 hours the duct pressure was increased from the initial 45.7" w.c. to 48" w.c. at 0930 hours, this slow increase in mill differential had stopped, and appeared to actually start to decrease.

The feeder speed was then raised on mills 2B and 2H to 85%, or approximately 116,000 #/hr, since the plant requires this load for mill-out operation with high rock/fuel ratio. The primary air duct pressure was raised to 49.5" H_2O during this test, which was the maximum static pressure capability with the primary air fan dampers wide open and the primary air fans on low speed selection (the plant's primary air fans are dual speed, but the higher speed is generally not used). The mill operation was then closely monitored with control room and field data/observations while starting at 1040 hours and ending at 1128 hours, before the primary air duct pressure was gradually lowered back down to 42.9" H_2O.

At the beginning of the 85% feeder speed test, mill "2H" had approximately 27" H_2O (alternate) mill differential with fine rock rejects. Essentially, the duct pressure was raised to 49.5" H_2O and this high duct pressure was reached at the same time that the feeder speed reached 85% to control the air flow with some damper control range. This is the reason for the slight increase from 26.5" H_2O to 27" H_2O in (alternate) mill differential. Then, the (alternate) mill differential decreased to 26.7" and subsequently dropped to 25.7" H_2O at 1128 hours (less than one hour after the feeder speed increase to 85%). The mill's primary air flow damper position had decreased from 90% to 82% open in this same time frame, indicating sufficient delivery pressure for the system resistance. This condition of 85% feeder speed with 49.5" primary air duct pressure remained until 1330 hours, when the "2H" air flow damper had decreased to 80% open and (alternate) mill differential had decreased to 23.7" H_2O with no coal or rock rejects present. This compared against mill 2B's high feeder speed initial 1040 hour start conditions of 21.2" H_2O (alternate) mill differential with coal and sand rejects at an initial rate of ½ box in 10 minutes time span, gradually getting better towards 1330 hours (reference figure 3-2, comparing the indicated and alternate mill differentials for both mills 2H and 2B during the test). The 2.5" H_2O difference in (alternate) mill pressure drop between the mills with stationary and rotating throats was measured at the end of the three hour high feeder speed test with high rock/fuel ratio. It is not known whether this difference in mill differential would have gotten any smaller, but all indications showed the "2H" mill differential to be trending in the downward direction at 1330 hours (refer to figures 3-1 and 3-2).

The duct pressure was then lowered in increments back to the original 42.9" setpoint, and the "2H" primary air damper position subsequently increased from 80% to 92.8% (refer to figure 3-1). Note from figure 3-1 that at around 1400 hours with the lower duct pressure, the mill differential increased again; all occurring with the same 85% feeder speed. This critical turnaround where mill differential tends to slowly increase (simulating sand accumulation in the grinding zone) appears to be when the primary air flow damper is around 80% open. It is not known if or how long it would have taken the mill differential to eventually climb back up, but this example does show proof that insufficient primary air delivery pressure does indeed affect primary air flow and sand accumulation in the grinding zone, which subsequently causes high mill differential.

A comparison of mill 2H and 2B mill differential for the tests of 70 and 85% feeder speeds is also shown on figure 3-2. Note that at the start of the 70% feeder speed test and with low (44" w.c.) primary air duct pressure, the control room indications were around 6" w.c. different between the two mills. At the start of the 85% feeder speed test with 48" w.c. duct pressure, the control room indications were approximately 8" w.c. different between the two mills, and when the duct pressure peaked at 49.5" w.c. @ 1040 hours, the control room mill differential indications were around 7" w.c. difference, but as the mills were steady at 85% feeder speed and the higher duct pressure, the control room indicated mill differential came down on mill 2H, showing around 3" w.c. projected difference in indicated mill differential at 1230 hours. This corresponds well to the 2.5" w.c. difference in (alternate) mill differential.

Figure 3-2 also plots the alternate mill differential, commencing at 1040 hours and ending at 1330 hours. In this time frame, the difference in alternate mill differential decreased from 5.5" w.c. at 1040 hours to 2.5" w.c. at 1330 hours. With either method of reporting mill differential, the difference between the two mills decreased by 3" w.c., while the rejects from mill 2B were initially on the verge of being uncontrollable, with initial rates of one-half box of coal and sand in 10 minutes time, but gradually getting better. Comparatively, there were only small amounts of fine rock rejects from mill 2H initially, with no rejects from 1128 hours on to the completion of the test. The following table represents data with 85% feeder speed on both mills 2B and 2H directly after raising the duct pressure to 49.5" w.c., but also shows the results after the duct pressure was lowered back to 42.9" w.c. (in conjunction with figure 3-1):

Table 2: Effect of Duct Pressure on Mill Performance (85% Feeder Speed)

TIME	FDR SPD	PA DUCT PRESS	2H DMPR,%	2H K60-K62	2H REJECTS	2B K60-K62	2B REJECTS
1040	85%	49.5	78	26.5	fine rock only	20.8	1/2box coal/sand/10 min
	"	"	90	27.0		21.6	"
	"	"		26.7		21.8	"
1128	"	"	82	25.7	none	22.2	"
1330	"	49	80	23.7	"	21.2	Gradually getting better
	"	48.4	82		"		
1400	"	46.4	85	23.0	"		
	"	45	88		"		
1413	"	44.3	90		"		
1423	"	42.9	92.8	22.5	"	20.5	
1500	"	"	88		"		

Once again, the above table shows that with adequate primary air duct pressure available, the mill differential is not only stable, but will actually be reduced from values with bad coal and lower primary air duct pressure setpoints.

UNIT ONE UPSET CONDITION: MARCH 12, 1998

During our monitoring of the conditions shown in the two tables above, we noted that the unit one operator was reporting many mills with high rejects rates, similar to conditions explained by the plant on previous occassions. The primary air duct pressure on unit one was raised approximately 2" w.c., with this small increase positively affecting mill differential and rejects from increasing to gradually decreasing on mills "1F", "1G", and "1H" (refer to figures 5-1 and 5-2). It is interesting to note that these three mills are all on the same side of the boiler, and would have their raw coal bunkers filled at the same time. Note that from figure 5-2, the mills on the other side of unit one do not show high mill differential, but only the three operating mills on the "left" side. This may indicate a trend in the raw coal bunker loading sequence and procedure.

Based on the positive effects of increased primary air duct pressure on mill differential and rejects during the high rock/fuel ratio of 3/12/98 on both unit one and two, it appeared that by raising the primary air duct pressure setpoint during operation to compensate for high damper position and mill differential allowed adequate and constant air flow and subsequently allowed stable mill operation, whereas allowing the mill differential to increase to a point where the primary air flow damper opened beyond 80% caused inadequate and unstable air flow and mill operation, which eventually causes unstable mill differential with increasing rejects and power draw.

UNIT TWO UPSET CONDITION: JANUARY 21&22, 1998

To investigate the theory of inadequate primary air duct pressure creating insufficient primary air flow with rising mill differential, the computer archive system (PI) was accessed for unit two on January 21&22, 1998. This was identified by the plant as a time when there was a high rock/fuel ratio, requiring alot of the mills to undergo on-line cleaning due to the sand accumulation in the grinding track. This time frame is shown in figure 5-3, with the "2H" mill differential, coal flow, air flow and primary air damper position plotted against time. Note that the coal flow and air flow is constant throughout the time from 0800 hours on 1/21/98 until just before 1800 hours on 1/21/98, but that the indicated mill differential was slowly increasing from an initial 16" to 18". At this time of just before 1800 hours on 1/21/98, something caused the 2H mill master control to go up from some 46 TPH coal feed to above 60 TPH, thereby driving the air flow up towards 95%. It is not exactly known why the load demand was increased to this amount in a rather short period of time, but the plant states that this may have been during a time when another mill was experiencing sand accumulation. During this event, their procedure was to clean the plugged mill on-line, which involves a fast run-back on feeder speed to minimum; feeder trip; and air flow increased to maximum with the mill still running to sweep as much sand accumulation out of the mill as possible. This abrupt change in mill 2H load could then have represented it's shared load increase of the remaining in-service mills. In any case, after the 2H load was returned to around 46 TPH, the mill differential and damper position were

IP7_038725

both higher for the same corresponding fuel/air ratio and coal flow, indicating partial accumulation of heavy particles in the grinding track due to inadequate air supply while the primary air damper was wide open. It is interesting to note that the primary air duct pressure was set at 43.5" at 0800 hours, and dropping to 42.9" at 1741 hours, around the time the load was raised on 2H mill. At this time, the primary air duct pressure spiked up to approximately 44", but came down to around 43" almost immediately. The mill differential increased to around 20" at 1830 hours, and gradually increased to around 28" at 0800 hours 1/22/98, at which time the mill was brought off-line by tripping the feeder and cleaning the mill on-line. The primary air duct pressure was raised to 45.3" at 0830 hours on 1/22/98, but at that time the problem was out of control and far beyond resolution with this small change in duct pressure.

It appears that after the spike in load just before 1800 hours, mill 2H was doomed to failure, since prior to that, the duct pressure had been gradually decreasing, which was part of the unstable mill differential. After the spike at 1800 hours, the required damper position was some 7-10% higher than initially at 0800 hours, until slightly before midnight when the primary air flow is seen to be decreasing, and the damper stroked fully open to compensate for the insufficient air flow. The accumulation was well under way at this time, and mill differential is unstable, rising at a rate of approximately 2" per hour with relatively constant feeder speed.

This example was therefore following the same scenario as experienced on 3/12/98 when the unit was firing high rock/coal ratio fuel, and it was proven during those tests that if adequate primary air duct pressure is available (between 48.5-49.5" w.c.), the mill differential does not increase as experienced on January 21&22 1998, but rather by raising the duct pressure, the mill differential actually decreased over time as shown by figures 3-1 and 3-2, thereby showing the mill to self-clean itself on-line. More importantly, however, is that the January 21&22 1998 problem could have been avoided if this duct pressure was raised early on, using important parameters such as the damper position and mill differential to predict the sand accumulation scenario by recognizing the trend in the parameters.

RECOMMENDATIONS

A. Mill Differential Indication

As discussed in the clean air discussion of this report, and as can be seen from figures 1-7 thru 1-9 and figure 2-18, the existing method of mill differential indication for clean air or mill operation by using the K61 tap on the top of the primary air duct as the high side is not as consistent as using the K60 tap located on the side of the windbox. Therefore, we recommend that the K60 tap or the K13 tap, both shown on figure 4-1, be used as the high side of mill differential (previously referred to as alternate mill differential) to provide more reliable readings on either clean air or during operation on all mills in the plant.

B. Classifier Vanes

During our inspection of mill 2B, the classifier vane extensions were incorrectly installed on the "front side" of the fixed vane (when viewing the vane from the outside of the classifier). This extension vane should be installed on the "back side" to provide more support and to reduce the tendency to bend this vane.

C. <u>Primary Air Calibration</u>

The difference in K factors between the burner pipe traverse and primary air duct traverse should be investigated. The mill and boiler operation would benefit from the lower air flow generated by the higher burner pipe traverse K factor by producing higher fineness, lower unburned carbon, lower erosion, lower damper position, and utilization of larger amounts of hot air (less tempering). Unfortunately, if mill 2B represents typical operation of mills with stationary throats, these mills would not allow any air flow reduction due to the wear characteristics causing coal rejects, and air flow reduction would subsequently apply only to mills equipped with rotating throats.

D. <u>High Rock/Fuel Ratio Operation</u>

Obviously, the best solution to the mill operation with high rock/fuel ratio would be to get rid of the high rock/fuel raw feed by washing or other means like improved mining processes. The plant has stated that these options are not feasible, either from a contractual or economical viewpoint. Therefore, another solution to unstable and unreliable mill operation during these conditions is as follows:

D1) Closely monitor damper position, alternate mill differential, rejects quantity/quality, primary air flow and motor power by trending these parameters against raw feed rate with the plant's computer. The above parameter list would probably be in order of sensitivity and the unit operator (or monitored sub-program in the controls) should look more closely at mill differential and damper position.

D2) Assign threshhold limits to these parameters, with the initial 85% feeder speed input threshhold points of alternate mill differential at 22" w.c. and 80% damper position.

D3) When either of these parameters approach their threshhold limit, the primary air duct pressure should be increased up to a maximum of 49" w.c. (System capability with primary air fan discharge dampers wide open while the fans are running at low speed).

D4) An additional solution to controlling the parameters under their threshhold limits would be to raise the hydraulic pressure of the roll wheel loading system to 2400 psig pressure during the periods of high rock/fuel ratios, subsequently reducing mill differential by adding grinding pressure.

SUMMARY

The purpose of this test was to assess the performance of a mill equipped with a stationary throat and a mill equipped with a rotating throat during periods of normal operation and during periods of high rock content in the raw coal. Specifcally stated below are the plant's initial test objectives and the results found during the tests:

OBJECTIVE #1:

Verify mills with rotating throats have 2" w.c. higher pressure drop than mills with stationary throats at 70% feeder speed, and 5-7" w.c. higher at 95% feeder speeds (or when the plant experiences high rock content in the raw feed).

RESULT #1

Based on both the clean air and mill operation tests with good and bad coal (high rock content), the existing method of mill differential measurement is not reliable or consistent with load. Using either the K60 or K13 tap as the high side of mill differential is much more reliable and consistent with laws of fluid flow, and by referring to figure 2-18, there is virtually no difference in pressure drop between the two mills tested on low rock content fuel at either 70, 85 or 95% feeder speed, and by referring to figure 3-2, it was proven that when adequate primary air delivery pressure is available, the difference between the two mill's alternate mill differential was no more than 2.5" w.c. at 85% feeder speed with high rock/fuel ratio raw feed.

OBJECTIVE #2

Verify rotating throats cause dribble and tend to load up easier during high rock feed rates due to possible grinding zone recirculation.

RESULT #2

Providing there is adequate primary air duct pressure, the mills with rotating throats do not tend to load up easier than mills equipped with stationary throats, and as depicted during the high rock/fuel tests, the mills with the rotating throats have shown to actually unload accumulated sand and perform without any rejects. Conversely, the mill with the stationary throat rejected both coal and sand at an extremely high rate initially, but gradually got better.

OBJECTIVE #3

Compare mill performance between two throat designs at 70 and 95% feeder speed with both low and high rock/fuel ratios.

RESULT #3

The following table shows the comparison of the two mills:

	GOOD COAL (LOW ROCK RATIO)								BAD COAL	
Feeder Speed, %	70				95				85	
Mill Designation	2B		2H		2B		2H		2B	2H
Primary Air Duct Pressure, "W.C.	43.2		43.6		43.1		47.7		49.5	49.5
Primary Air Flow, %	87.5		88		98		99			
Primary Air Damper Position, %	65.7		73.4		100		93.2		80	80
Mill Inlet CFM	77,168		80,924		90,198		95,986			
Alternate Mill ΔP (K60-K62), "W.C.	14.9		15.0		22.8		24.0		21.2	23.7
Existing Mill ΔP (K61-K62), "W.C. (Control Room)	11.5		14.0		22.5		22.9		18.8	22.5
Existing Mill ΔP (K61-K62), "W.C. (Manometer)	11.05		13.0		22.45		23.1			
Classifier ΔP, "W.C. (Manometer)	5.4		5.4		6.7		7.1			
Mill Inlet Temperature, °F	307		316		318		364			
Mill Outlet Temperature, °F	148		150		148		148			
Hydraulic Loading Pressure, PSIG	2150		2100		2400		2400			
Avg. Mill Input Power, KW	542.9		547.3		604		559.1			
Pyrites Reject Rate	NONE		1 rock/15sec SOME COAL		1 box coal/10 min		1pc coal/30 SOME ROCK		1/2boxrock coal,sand/ 30 min	handful rock/5 min
Mill Operation	SMOOTH		LOW RUMBLE		SMOOTH		SMOOTH		SMOOTH	SMOOTH
Sample Analysis	IPP	B&W	IPP	B&W	IPP	B&W	IPP	B&W	NO	
Raw Coal Moisture, %	7.55		7.38		7.71		7.38		SAMPLING	
Raw Coal HGI	48.9		49.1		43.8		46.2		DONE	
Pulverized Coal Fineness									ON	
% Passing 50 Mesh	99.8	99.94	99.4	99.88	99.6	99.98	99.6	99.98	BAD	
% Passing 70 Mesh		99 86		99 68		99.78		99.58	COAL	
% Passing 100 Mesh	98.5	98.98	98.3	98.62	97.2	97.98	95 7	95 8		
% Passing 140 Mesh		93.1		92.1		89.72		83.32		
% Passing 200 Mesh	79.8	80.7	77.6	79 42	74.8	76 04	64.8	66 52		

IP7_038729

The above comparison shows at 70% feeder speed and good coal, both mill's alternate mill differential were essentially the same (0.1" w.c. difference), and at 95% feeder speed and good coal, the 2H alternate mill differential was 1.2" w.c. higher than mill 2B, with unacceptable rejects rate on mill 2B, subsequently skewing the fineness higher. To control this high coal rejects rate, the air flow should have been higher, which would have lowered the 2B mill fineness.

Based on the fineness achieved on mill 2H at 130,000 #/hr coal flow with 46.2 HGI, the pulverizer is producing the fineness as expected, corrected for the lower than standard HGI.

The average mill input power is essentially the same on both mills at 70% feeder speed, but 2H mill demonstrated slightly lower power requirements at 95% feeder speed.

With bad coal at 85% feeder speed and adequate air supply, the indicated mill differential was 3.7" w.c. higher on mill 2H, and alternate mill differential was 2.5" w.c. higher.

OBJECTIVE #4

Determine the root causes and their resolutions.

RESULT #4

The root cause of the previous instances of high mill differential and rejects rate at high rock/fuel ratios can be attributed to an inadequate delivery of primary air supply to the mill. This is evidenced by the flow control damper going well past it's effective range of around 80%, and experiencing the mill differential in an unstable condition of gradual increase until the primary air flow is actually affected.

The resolutions are to closely monitor mill differential and damper position trends vs. feeder speed to always "stay ahead" of system resistance with primary air delivery, using 22" alternate mill differential and 80% damper position threshholds to increase the primary air duct pressure setpoint to a maximum of 49.5" while the primary air fans are on low speed. Additional measures would include increasing the hydraulic loading pressure to 2400 psig to the roll wheels.

CUSTOMER·	INTERMOUNTAIN POWER												
ANT:	INTERMOUNTAIN												
NTRACT NO ·	RB-615		(FILE ID.2BCLEAN.WK4)										
RFORMED BY:	GN KIRK, DR DOUGAN, NS MOEN												
DATE.	MO/DAY/YR	3/9/98							TEST				
TIME.	HOURS	1743		1815					AVG.				
PULVERIZER NUMBER	#	2B		2B					2B				
BAROMETRIC PRESSURE	IN Hg	25.62		25 62					25.62				
PRIMARY AIR FLOW (CR)	%	80		80					80.00				
PRIMARY AIR FLOW (CR)	LB/HR	N/A		N/A					0 00				
PRIMARY AIR DIFF (CR)	IN WG	N/A		N/A					0.00				
PRIMARY AIR DIFF. (MAN)	IN WG	1.85		1.84					1.85				
PA PLENUM PRESS (CR)	IN WG	N/A		N/A					0.00				
LOW SIDE PA DIFF STATIC(MAN)	IN WG	40		39.8					39.90				
PA DAMPER POSITION	%	51.5		51.5					51.50				
HISIDE MILL DIFF STATIC(K61)SIDE	IN WG	N/A		N/A					0.00				
WINDBOX SIDE STATIC (K60L)	IN WG	7.8		8 0					7.90				
WINDBOX SIDE TEMP (K60L)	F	97		95					96.00				
WINDBOX SIDE STATIC (K60R)	IN WG	N/A		N/A					0.00				
MILL DIFF (CR) K61-K62	IN WG	N/A		N/A					0.00				
MILL DIFF (MAN) K61-K62	IN WG	0 90		0.85					0 88				
LOSIDE MILL DIFF STATIC(K62)	IN WG	3.7		3.7					3.70				
BURNER PIPE STATIC (BPS)	IN WG	N/A		N/A					0.00				
CLASSIFIER DIFF (K62-BPS)	IN WG	3.1		3.2					3.15				
MILL DIFFERENTIAL (K60-K62)	IN WG	4.3		4.3					4 30				
MILL INLET AIR TEMP (CR)	F	94		94					94 00				
MILL OUTLET AIR TEMP (CR)	F	97		97					97.40				
AIR TEMP AT TRAVERSE	F	97		98		94		93		96		97	
STATIC PRESSURE AT TRAVERSE	IN WG	0 75		0.90		0 95		0.85		0.80		0.75	
BURNER PIPE TRAVERSE NUMBE	*	1		2		3		4		5		6	
PITOT TUBE READINGS		Ho	SQRT(Ho)	Ho	SQRT(Ho)	Ho	SQRT(Ho)	Ho	SQRT(Ho)	Ho	SQRT(Ho)	Ho	SQRT(Ho)
1	IN WG	0.630	0.79	0.732	0.86	0.639	0.80	0.488	0.70	0.705	0.84	0.654	0.81
2	IN WG	0.940	0 97	0.832	0.91	0.888	0.94	0.871	0.93	0.864	0.93	0.756	0.87
3	IN WG	0.915	0.96	0.817	0.90	0.942	0.97	0.888	0.94	0.898	0.95	0.793	0.89
4	IN WG	0.871	0.93	0 798	0.89	0.935	0.97	0.883	0.94	0.878	0.94	0.791	0.89
5	IN WG	0 813	0.90	0.737	0.86	0.915	0.96	0.864	0.93	0.835	0.91	0.766	0.88
6	IN WG	0.749	0.87	0.771	0.88	0.839	0.92	0.808	0.90	0.781	0.88	0.725	0.85
7	IN WG	0.681	0.83	0.866	0.93	0.737	0.86	0.744	0.86	0.739	0.86	0 727	0.85
8	IN WG	0 712	0.84	0.920	0 96	0.710	0.84	0.759	0 87	0.734	0.86	0.764	0.87
9	IN WG	0 739	0.86	0.983	0.99	0.725	0.85	0.766	0.88	0 752	0.87	0.822	0.91
10	IN WG	0 761	0.87	0.998	1.00	0.732	0.86	0 791	0.89	0 734	0.86	0.844	0.92
11	IN WG	0 742	0.86	0.957	0.98	0.693	0 83	0.747	0.86	0.686	0.83	0.815	0.90
12	IN WG	0.715	0.85	0.896	0.95	0.710	0 84	0.734	0.86	0.644	0.80	0.759	0.87
1	IN WG	0.759	0.87	0.835	0.91	0.615	0 78	0.512	0.72	0.488	0.70	0.686	0.83
2	IN WG	0.918	0 96	0.962	0.98	0 744	0.86	0.647	0.80	0.732	0.86	0.883	0.94
3	IN WG	1.013	1.01	0 971	0.99	0.747	0.86	0 698	0.84	0.747	0.86	0.888	0.94
4	IN WG	0.969	0.98	0 942	0.97	0.739	0.86	0 708	0.84	0.752	0.87	0.869	0.93
5	IN WG	0.927	0 96	0.913	0.96	0 730	0.85	0.737	0.86	0.754	0.87	0.822	0.91
6	IN WG	0.830	0.91	0 866	0.93	0.727	0.85	0 734	0.86	0.756	0.87	0.749	0 87
7	IN WG	0.686	0.83	0.700	0.84	0.849	0.92	0.837	0.91	0.827	0.91	0.695	0.83
8	IN WG	0.698	0.84	0 703	0.84	0.876	0 94	0.908	0.95	0.883	0.94	0.690	0 83
9	IN WG	0.717	0.85	0.712	0.84	0.920	0.96	0.930	0.96	0.913	0.96	0.705	0.84
10	IN WG	0.759	0 87	0.732	0.86	0.935	0.97	0.940	0.97	0.915	0.96	0.703	0.84
11	IN WG	0.734	0.86	0.747	0.86	0.893	0.94	0.835	0.91	0.883	0.94	0.698	0.84
12	IN WG	0.700	0 84	0.715	0.85	0.886	0.94	0.852	0.92	0.854	0.92	0.681	0.83
SUM OF SQRT Ho			21.297		21.928		21.382		21.112		21.171		20.928
AVG SQRT Ho			0.887		0.914		0.891		0.880		0.882		0 872
AIR INLET DENSITY (di)	LB/FT3		0.0684		0.0684		0.0684		0.0684		0.0684		0.0684
AIR DENSITY AT OUTLET, (do)	LB/FT3		0.0612		0.0611		0.0616		0.0617		0.0613		0.0612
SQRT do			0.2474		0.2472		0.2481		0.2483		0.2476		0.2474
PIPE I.D	IN		21.00		21.00		21.00		21.00		21.00		21.00
BURNER PIPE AREA (A)	FT^2		2.405		2.405		2.405		2.405		2.405		2.405
VELOCITY (V)=1096*(Ho/do)^.5	FT/MIN		3932		4051		3936		3883		3905		3864
VOLUME FLOW (Qo) Qo=V*A	FT^3/MIN		9457		9743		9466		9340		9392		9293
MASS FLOW (W) W=Qo*do	LB/MIN		578.68		595.39		582.73		575.80		575.80		568.65
SQRT (H1 * di)			0 355		0.355		0.355		0.355		0.355		0.355
K= W/ (SQRT H1*di)			1629		1676		1640		1620		1620		1600
SUM OF K			9786		9786		9786		9786		9786		9786
TOTAL VOLUME FLOW(Qo)Qo=V*A	FT^3/MIN		56691										
TOTAL MASS FLOW (W) W=Qo*do	LB/HR		208623										
INLET VOLUME FLOW	FT^3/MIN		50811										
LOWEST K			1600		1600		1600		1600		1600		1600
% DEV. FROM LOWEST K			1.76		4.70		2.48		1.26		1.26		0.00
AVG K			1631		1631		1631		1631		1631		1631
% DEV. FROM AVG K			-0.14		2.74		0.56		-0.64		-0.64		-1.87

STOMER	INTERMOUNTAIN POWER												
NT	INTERMOUNTAIN												
NTRACT NO	RB-614	(FILE ID 2BCLEAN WK4)											
RFORMED BY	GN KIRK, DR DOUGAN, NS MOEN												
DATE	MO/DAY/YR	3/9/98							TEST				
TIME	HOURS	1845		1945					AVG				
PULVERIZER NUMBER	#	2B		2B					2B				
BAROMETRIC PRESSURE	IN Hg	25 60		25 60					25 60				
PRIMARY AIR FLOW (CR)	%	90		90					90 00				
PRIMARY AIR FLOW (CR)	LB/HR	N/A		N/A					0 00				
PRIMARY AIR DIFF (CR)	IN WG	N/A		N/A					0 00				
PRIMARY AIR DIFF (MAN)	IN WG	2 270		2 275					2 273				
PA PLENUM PRESS (CR)	IN WG	N/A		N/A					0 00				
LOW SIDE PA DIFF STATIC(MAN)	IN WG	38 5		38 5					38 50				
PA DAMPER POSITION	%	55 2		55 2					55 20				
HISIDE MILL DIFF STATIC(K61)SIDE	IN WG	N/A		N/A					0 00				
WINDBOX SIDE STATIC (K60L)	IN WG	10 0		10 2					10 10				
WINDBOX SIDE TEMP (K60L)	F	95 4		93					94 20				
WINDBOX SIDE STATIC (K60R)	IN WG	N/A		N/A					0 00				
MILL DIFF (CR) K61-K62	IN WG	N/A		N/A					0.00				
MILL DIFF (MAN) K61-K62	IN WG	2 100		2 000					2 050				
LOSIDE MILL DIFF STATIC(K62)	IN WG	4 6		4 9					4 75				
BURNER PIPE STATIC (BPS)	IN WG	N/A		N/A					0 00				
CLASSIFIER DIFF (K62-BPS)	IN WG	3 8		3 8					3 80				
MILL DIFFERENTIAL (K60-K62)	IN WG	5 3		5 3					5.30				
MILL INLET AIR TEMP (CR)	F	94		94					94.00				
MILL OUTLET AIR TEMP (CR)	F	97		97					97 40				
AIR TEMP AT TRAVERSE	F	98		96		93		96		98		98	
STATIC PRESSURE AT TRAVERSE	IN WG	1 10		0 90		1 05		1 00		0 95		0.90	
BURNER PIPE TRAVERSE NUMBER	*	1		2		3		4		5		6	
PITOT TUBE READINGS		Ho	SQRT(Ho)	Ho	SQRT(Ho)	Ho	SQRT(Ho)	Ho	SQRT(Ho)	Ho	SQRT(Ho)	Ho	SQRT(Ho)
1	IN WG	0 661	0 81	0 686	0 83	0 869	0.93	0 844	0 92	0 700	0 84	0.844	0 92
2	IN WG	1 150	1 07	1 135	1 07	1 118	1 06	1 035	1 02	0 893	0 94	0 925	0 96
3	IN WG	1 184	1.09	1 203	1 10	1 159	1 08	1 086	1.04	0 925	0 96	0 986	0 99
4	IN WG	1 191	1 09	1 154	1 07	1 142	1 07	1.079	1 04	0 905	0 95	0 988	0 99
5	IN WG	1 113	1 05	1 115	1 06	1 125	1.06	1.045	1.02	0.937	0 97	0 964	0 98
6	IN WG	1 008	1 00	1 040	1 02	1 013	1 01	0 993	1 00	0.891	0 94	0 881	0.94
7	IN WG	0 808	0 90	0.861	0 93	0.854	0.92	0.886	0.94	1.013	1 01	0 881	0 94
8	IN WG	0 849	0 92	0 854	0 92	0 886	0.94	0 910	0.95	1 062	1.03	0.954	0 98
9	IN WG	0 869	0 93	0 864	0 93	0 891	0 94	0.925	0.96	1.096	1.05	0 991	1 00
10	IN WG	0 908	0 95	0 888	0 94	0 925	0 96	0.932	0.97	1.140	1.07	1.025	1 01
11	IN WG	0 896	0 95	0 886	0 94	0 888	0.94	0 864	0 93	1 052	1 03	0 969	0 98
12	IN WG	0 883	0 94	0 857	0 93	0 844	0 92	0 893	0 94	0 983	0 99	0 937	0 97
1	IN WG	0 952	0 98	0 671	0.82	0.822	0 91	0.656	0 81	0 788	0 89	0 842	0 92
2	IN WG	1 123	1.06	0 954	0.98	0.905	0.95	0 800	0 89	1 103	1 05	1 096	1 05
3	IN WG	1 132	1 06	0 988	0.99	0 947	0 97	0 891	0 94	1 101	1 05	1 079	1 04
4	IN WG	1 030	1 01	0 969	0 98	0 881	0 94	0 859	0 93	1.069	1 03	1.040	1 02
5	IN WG	0 981	0 99	0 922	0 96	0 871	0 93	0 888	0.94	1.035	1 02	1 001	1 00
6	IN WG	0 903	0 95	0 920	0 96	0 861	0 93	0 903	0.95	0 957	0 98	0 913	0 96
7	IN WG	0 852	0 92	1 074	1 04	1 040	1 02	1 015	1 01	0.900	0 95	0 839	0 92
8	IN WG	0 844	0 92	1 162	1 08	1 110	1 05	1 110	1.05	0 900	0 95	0 835	0 91
9	IN WG	0 937	0 97	1.206	1 10	1 135	1 07	1 140	1.07	0 913	0 96	0 854	0 92
10	IN WG	0 942	0 97	1 218	1 10	1 150	1 07	1 145	1.07	0 908	0.95	0 861	0 93
11	IN WG	0 893	0 94	1 135	1 07	1 098	1 05	1 064	1.03	0 835	0 91	0 788	0 89
12	IN WG	0 847	0 92	0 986	0.99	1 023	1 01	1.040	1.02	0 776	0.88	0 788	0 89
SUM OF SQRT Ho			23 416		23 799		23.735		23 450		23.393		23 100
AVG SQRT Ho			0 976		0.992		0.989		0 977		0.975		0 962
AIR INLET DENSITY (di)	LB/FT3		0 0681		0 0681		0.0681		0 0681		0.0681		0 0681
AIR DENSITY AT OUTLET, (do)	LB/FT3		0 0611		0 0613		0 0616		0.0613		0 0611		0 0611
SQRT do			0.2472		0 2475		0 2483		0.2476		0.2471		0 2471
PIPE I.D.	IN		21.00		21.00		21.00		21.00		21 00		21 00
BURNER PIPE AREA (A)	FT^2		2 405		2 405		2 405		2 405		2 405		2.405
VELOCITY (V)=1096*(Ho/do)^ 5	FT/MIN		4326		4390		4366		4325		4323		4269
VOLUME FLOW (Qo) Qo=V*A	FT^3/MIN		10406		10560		10501		10404		10398		10268
MASS FLOW (W) W=Qo*do	LB/MIN		635 75		647 13		647 27		637.73		634.97		626 98
SQRT (H1 * di)			0 393		0.393		0 393		0.393		0.393		0 393
K= W/ (SQRT H1*di)			1616		1645		1645		1621		1614		1593
SUM OF K			9733		9733		9733		9733		9733		9733
TOTAL VOLUME FLOW(Qo)Qo=V*A	FT^3/MIN		62537										
TOTAL MASS FLOW (W) W=Qo*do	LB/HR		229790										
INLET VOLUME FLOW	FT^3/MIN		56209										
LOWEST K			1593		1593		1593		1593		1593		1593
% DEV FROM LOWEST K			1 40		3 21		3.24		1 71		1.28		0 00
AVG K			1622		1622		1622		1622		1622		1622
% DEV FROM AVG K			-0 40		1 38		1.41		-0 09		-0.52		-1.77

STOMER	INTERMOUNTAIN POWER												
NT	INTERMOUNTAIN												
TRACT NO	RB-615	(FILE ID 2BCLEAN WK4)											
RFORMED BY	GN KIRK, DR DOUGAN, NS MOEN												
DATE	MO/DAY/YR	3/9/98							TEST				
TIME	HOURS	1945		2034					AVG				
PULVERIZER NUMBER	#	2B		2B					2B				
BAROMETRIC PRESSURE	IN Hg	25.60		25 60					25 60				
PRIMARY AIR FLOW (CR)	%	100		100					100 00				
PRIMARY AIR FLOW (CR)	LB/HR	N/A		N/A					0 00				
PRIMARY AIR DIFF. (CR)	IN WG	N/A		N/A					0 00				
PRIMARY AIR DIFF (MAN)	IN WG	3 01		2 98					3 00				
PA PLENUM PRESS (CR)	IN WG	N/A		N/A					0.00				
LOW SIDE PA DIFF STATIC(MAN)	IN WG	37		36 7					36 85				
PA DAMPER POSITION	%	59 9		59.9					59 90				
HISIDE MILL DIFF STATIC(K61)SIDE	IN WG	N/A		N/A					0 00				
WINDBOX SIDE STATIC (K60L)	IN WG	13 1		13 1					13.10				
WINDBOX SIDE TEMP (K60L)	F	94		93					93 50				
WINDBOX SIDE STATIC (K60R)	IN WG	N/A		N/A					0 00				
MILL DIFF (CR) K61-K62	IN WG	N/A		N/A					0 00				
MILL DIFF (MAN) K61-K62	IN WG	2 40		2 40					2 40				
LOSIDE MILL DIFF STATIC(K62)	IN WG	6 6		6 6					6 60				
BURNER PIPE STATIC (BPS)	IN WG	N/A		N/A					0 00				
CLASSIFIER DIFF (K62-BPS)	IN WG	4.6		4 8					4 70				
MILL DIFFERENTIAL (K60-K62)	IN WG	6 5		6 5					6.50				
MILL INLET AIR TEMP (CR)	F	94		94					94 00				
MILL OUTLET AIR TEMP (CR)	F	97		97					97 40				
AIR TEMP AT TRAVERSE	F	100		100		97		96		96		96	
STATIC PRESSURE AT TRAVERSE	IN WG	1 35		1.50		1 20		1 20		1.35		1 35	
BURNER PIPE TRAVERSE NUMBER	*	1		2		3		4		5		6	
PITOT TUBE READINGS		Ho	SQRT(Ho)	Ho	SQRT(Ho)	Ho	SQRT(Ho)	Ho	SQRT(Ho)	Ho	SQRT(Ho)	Ho	SQRT(Ho)
1	IN WG	1 335	1 16	1 140	1 07	1 159	1 08	0 695	0 83	0.915	0 96	0.876	0 94
2	IN WG	1 491	1 22	1 242	1 11	1 379	1 17	0 954	0.98	1.276	1 13	1 018	1 01
3	IN WG	1 489	1 22	1 264	1.12	1.472	1.21	1 084	1.04	1 379	1 17	1.240	1 11
4	IN WG	1 486	1.22	1 225	1.11	1 450	1 20	1 101	1 05	1 384	1 18	1 208	1 10
5	IN WG	1 425	1 19	1 203	1 10	1 408	1.19	1.115	1 06	1.318	1 15	1 184	1 09
6	IN WG	1.291	1 14	1 193	1.09	1 303	1 14	1 223	1 11	1 247	1 12	1 135	1 07
7	IN WG	1 049	1 02	1 428	1 19	1 115	1 06	1 364	1 17	1 123	1.06	1 159	1 08
8	IN WG	1 081	1 04	1 499	1 22	1 115	1.06	1 418	1 19	1 123	1.06	1.240	1 11
9	IN WG	1 152	1 07	1 579	1.26	1 101	1 05	1 421	1 19	1 162	1.08	1 284	1 13
10	IN WG	1 159	1.08	1 577	1.26	1 123	1 06	1 467	1.21	1 174	1 08	1 306	1 14
11	IN WG	1 196	1.09	1 428	1 19	1 081	1 04	1 389	1 18	1 069	1 03	1 245	1 12
12	IN WG	1.120	1 06	1 408	1 19	1 040	1 02	1 047	1.02	0 900	0 95	1 135	1.07
1	IN WG	1 064	1.03	1 150	1.07	1 052	1 03	0.825	0 91	0 893	0 94	0 979	0 99
2	IN WG	1 445	1.20	1 467	1.21	1 157	1.08	1 218	1 10	1 147	1 07	1 245	1 12
3	IN WG	1 455	1.21	1 513	1.23	1 233	1 11	1 379	1 17	1 176	1 08	1.374	1 17
4	IN WG	1 369	1 17	1 477	1.22	1.215	1 10	1 352	1 16	1 208	1 10	1.335	1 16
5	IN WG	1 257	1 12	1 374	1.17	1.206	1 10	1 318	1 15	1 140	1 07	1 267	1 13
6	IN WG	1 123	1 06	1 279	1 13	1.220	1 10	1.262	1 12	1 132	1 06	1 167	1 08
7	IN WG	1 128	1 06	1 086	1 04	1.364	1 17	1 152	1 07	1.320	1.15	1 069	1 03
8	IN WG	1 147	1 07	1 091	1 04	1 438	1.20	1 164	1.08	1 394	1 18	1 045	1 02
9	IN WG	1 157	1 08	1 093	1 05	1 430	1.20	1 176	1 08	1 443	1 20	1 081	1 04
10	IN WG	1 211	1 10	1 164	1 08	1 447	1 20	1 193	1.09	1 447	1.20	1 091	1 04
11	IN WG	1 223	1 11	1 123	1.06	1.394	1 18	1 154	1.07	1 355	1 16	1.037	1.02
12	IN WG	1 074	1 04	1 136	1 07	1 084	1 04	0 979	0.99	1 128	1.06	1 005	1 00
SUM OF SQRT Ho			26 754		27 284		26 781		26 039		26 256		25 758
AVG SQRT Ho			1 115		1 137		1 116		1 085		1 094		1 073
AIR INLET DENSITY (di)	LB/FT3		0 0678		0 0678		0 0678		0.0678		0.0678		0 0678
AIR DENSITY AT OUTLET, (do)	LB/FT3		0.0609		0 0609		0.0612		0 0613		0 0614		0 0614
SQRT do			0.2468		0 2469		0 2474		0.2477		0 2477		0 2477
PIPE I D.	IN		21 00		21 00		21 00		21.00		21 00		21 00
BURNER PIPE AREA (A)	FT^2		2 405		2 405		2 405		2 405		2 405		2 405
VELOCITY (V)=1096*(Ho/do)^ 5	FT/MIN		4950		5047		4943		4802		4841		4749
VOLUME FLOW (Qo) Qo=V*A	FT^3/MIN		11906		12139		11889		11549		11643		11422
MASS FLOW (W) W=Qo*do	LB/MIN		725 32		739.86		727 86		708 34		714.39		700 84
SQRT (H1 * di)			0 451		0 451		0 451		0 451		0 451		0 451
K= W/ (SQRT H1*di)			1609		1641		1615		1571		1585		1555
SUM OF K			9576		9576		9576		9576		9576		9576
TOTAL VOLUME FLOW(Qo)Qo=V*A	FT^3/MIN		70548										
TOTAL MASS FLOW (W) W=Qo*do	LB/HR		258997										
INLET VOLUME FLOW	FT^3/MIN		63625										
LOWEST K			1555		1555		1555		1555		1555		1555
% DEV. FROM LOWEST K			3 49		5.57		3 86		1 07		1.93		0 00
AVG K			1596		1596		1596		1596		1596		1596
% DEV. FROM AVG K			0.82		2.84		1 17		-1 54		-0 70		-2 58

STOMER·	INTERMOUNTAIN POWER			
NT.	INTERMOUNTAIN			
NTRACT NO.	RB-615	(FILE ID·2HCLEAN.WK4)		
PERFORMED BY:	GN KIRK, DR DOUGAN, NS MOEN			
DATE:	MO/DAY/YR	3/10/98		TEST
TIME.	HOURS	1715	1815	AVG.
PULVERIZER NUMBER·	#	2H	2H	2H
BAROMETRIC PRESSURE	IN Hg	25 62	25 62	25.62
PRIMARY AIR FLOW (CR)	%	80	82	81.00
PRIMARY AIR FLOW (CR)	LB/HR	N/A	N/A	0 00
PRIMARY AIR DIFF. (CR)	IN WG	2	2	2.00
PRIMARY AIR DIFF. (MAN)	IN WG	2.02	2.01	2.02
PA PLENUM PRESS (CR)	IN WG	43.3	43.3	43.30
LOW SIDE PA DIFF STATIC(MAN)	IN WG	39.9	39 6	39.75
PA DAMPER POSITION	%	N/A	N/A	0.00
HISIDE MILL DIFF STATIC(K61)SIDE	IN WG	N/A	N/A	0.00
WINDBOX SIDE STATIC (K60L)	IN WG	7.3	7 5	7.40
WINDBOX SIDE TEMP (K60L)	F	96.5	96 1	96.30
WINDBOX SIDE STATIC (K60R)	IN WG	N/A	N/A	0 00
MILL DIFF (CR) K61-K62	IN WG	N/A	N/A	0 00
MILL DIFF (MAN) K61-K62	IN WG	1.90	2.00	1.95
LOSIDE MILL DIFF STATIC(K62)	IN WG	3	3.4	3.20
BURNER PIPE STATIC (BPS)	IN WG	N/A	N/A	0.00
CLASSIFIER DIFF (K62-BPS)	IN WG	2.9	2.85	2.88
MILL DIFFERENTIAL (K60-K62)	IN WG	4.1	4.1	4.10
MILL INLET AIR TEMP (CR)	F	93	93	93.00
MILL OUTLET AIR TEMP (CR)	F	96	94	95.10

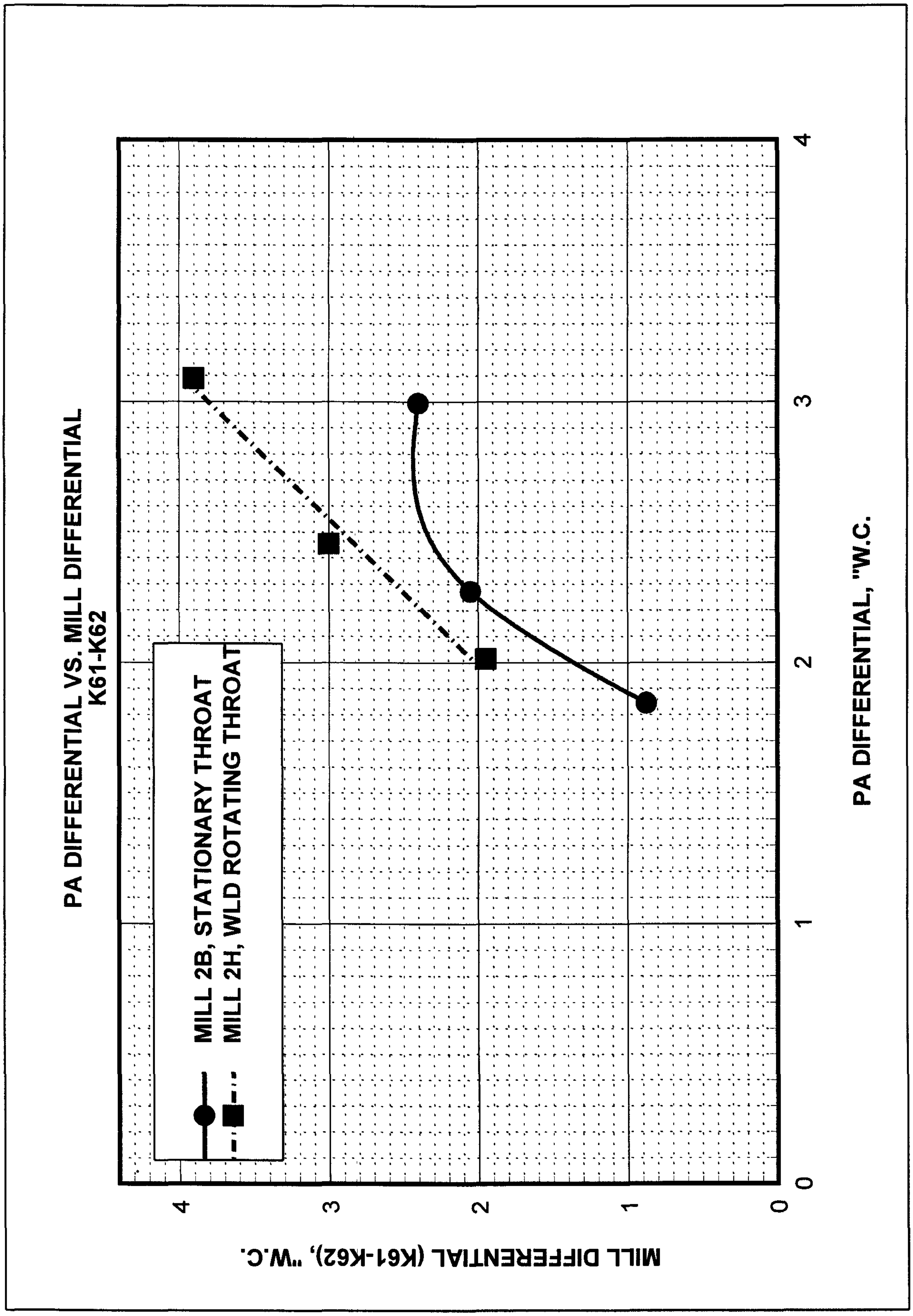
AIR TEMP AT TRAVERSE	F	74		75		75		76		75		76	
STATIC PRESSURE AT TRAVERSE	IN WG	0.80		0.85		0 90		0.85		0.80		0 85	
BURNER PIPE TRAVERSE NUMBE	*	1		2		3		4		5		6	
PITOT TUBE READINGS		Ho	SQRT(Ho)	Ho	SQRT(Ho)	Ho	SQRT(Ho)	Ho	SQRT(Ho)	Ho	SQRT(Ho)	Ho	SQRT(Ho)
1	IN WG	0.544	0.74	0.610	0.78	0.732	0.86	0.725	0.85	0.722	0.85	0.698	0.84
2	IN WG	0.820	0.91	0.815	0.90	0.849	0.92	0.859	0.93	0.852	0.92	0.893	0.94
3	IN WG	0.874	0.93	0.861	0.93	0.905	0.95	0.871	0.93	0.918	0.96	0.922	0.96
4	IN WG	0.876	0.94	0.844	0.92	0.905	0.95	0.859	0.93	0.922	0.96	0.913	0.96
5	IN WG	0 881	0 94	0.859	0.93	0.898	0.95	0.854	0.92	0.925	0.96	0.893	0.94
6	IN WG	0 854	0 92	0.861	0.93	0.888	0.94	0.813	0 90	0.927	0.96	0.844	0.92
7	IN WG	0.835	0.91	0.798	0.89	0.825	0.91	0.808	0.90	0.896	0.95	0.781	0.88
8	IN WG	0.825	0.91	0.776	0.88	0.798	0.89	0.793	0.89	0.874	0.93	0.749	0.87
9	IN WG	0.825	0.91	0.769	0.88	0.795	0.89	0.798	0.89	0.835	0.91	0.734	0 86
10	IN WG	0.820	0.91	0.747	0 86	0.788	0.89	0.795	0.89	0.798	0.89	0.727	0.85
11	IN WG	0.783	0.88	0.700	0.84	0.752	0 87	0 764	0.87	0.764	0.87	0.725	0.85
12	IN WG	0.739	0.86	0.615	0.78	0.673	0.82	0.649	0.81	0 710	0.84	0 666	0.82
1	IN WG	0.576	0.76	0.417	0.65	0.546	0 74	0.498	0.71	0.593	0.77	0.744	0.86
2	IN WG	0.705	0.84	0.695	0.83	0.690	0.83	0.615	0.78	0.776	0 88	0.896	0.95
3	IN WG	0.771	0.88	0.720	0.85	0.734	0.86	0.722	0.85	0.842	0 92	0.922	0.96
4	IN WG	0.771	0.88	0.764	0.87	0.715	0.85	0.698	0.84	0.837	0 91	0.920	0.96
5	IN WG	0.783	0.88	0.769	0.88	0.808	0.90	0.732	0 86	0.859	0.93	0.900	0 95
6	IN WG	0.847	0 92	0.827	0.91	0.830	0.91	0.761	0 87	0.888	0.94	0.874	0.93
7	IN WG	0 893	0 94	0.839	0.92	0.908	0.95	0.869	0.93	0.918	0.96	0.803	0.90
8	IN WG	0.913	0 96	0.844	0.92	0.913	0.96	0.903	0.95	0.942	0.97	0.800	0.89
9	IN WG	0.905	0.95	0 839	0.92	0.915	0.96	0.908	0.95	0.944	0.97	0 813	0.90
10	IN WG	0.903	0.95	0.847	0.92	0.913	0.96	0.908	0 95	0.930	0.96	0.857	0.93
11	IN WG	0.871	0.93	0 817	0.90	0.849	0.92	0.896	0.95	0 871	0.93	0.817	0 90
12	IN WG	0 742	0.86	0.786	0.89	0.595	0.77	0.827	0.91	0.686	0.83	0.764	0.87
SUM OF SQRT Ho			21.514		20.971		21.433		21.265		22 000		21.694
AVG SQRT Ho			0.896		0.874		0.893		0.886		0.917		0 904
AIR INLET DENSITY (di)	LB/FT3		0.0685		0.0685		0.0685		0.0685		0.0685		0.0685
AIR DENSITY AT OUTLET, (do)	LB/FT3		0 0638		0.0637		0.0637		0.0636		0.0637		0 0636
SQRT do			0.2527		0.2524		0.2525		0.2522		0.2524		0.2522
PIPE I.D.	IN		21 00		21.00		21 00		21.00		21.00		21 00
BURNER PIPE AREA (A)	FT^2		2.405		2.405		2.405		2.405		2.405		2.405
VELOCITY (V)=1096*(Ho/do)^.5	FT/MIN		3888		3794		3877		3851		3980		3928
VOLUME FLOW (Qo) Qo=V*A	FT^3/MIN		9353		9125		9325		9262		9573		9448
MASS FLOW (W) W=Qo*do	LB/MIN		597.06		581.50		594.35		589 11		609.97		600 98
SQRT (H1 * di)			0 372		0.372		0.372		0.372		0.372		0.372
K= W/ (SQRT H1*di)			1607		1565		1599		1585		1641		1617
SUM OF K			9615		9615		9615		9615		9615		9615
TOTAL VOLUME FLOW(Qo)Qo=V*A	FT^3/MIN		56086										
TOTAL MASS FLOW (W) W=Qo*do	LB/HR		214378										
INLET VOLUME FLOW	FT^3/MIN		52139										
LOWEST K			1565		1565		1565		1565		1565		1565
% DEV. FROM LOWEST K			2.68		0.00		2.21		1.31		4.90		3.35
AVG K			1603		1603		1603		1603		1603		1603
% DEV. FROM AVG K			0.26		-2.35		-0.19		-1.07		2.43		0 92

CUSTOMER	INTERMOUNTAIN POWER												
PLANT	INTERMOUNTAIN												
CONTRACT NO	RB-614		(FILE ID 2HCLEAN;WK4)										
PERFORMED BY	GN KIRK, DR DOUGAN, NS MOEN												
DATE	MO/DAY/YR		3/10/98						TEST				
TIME	HOURS	1815		1908					AVG				
PULVERIZER NUMBER	#	2H		2H					2H				
BAROMETRIC PRESSURE	IN Hg	25 56		25.56					25 56				
PRIMARY AIR FLOW (CR)	%	90		90					90.00				
PRIMARY AIR FLOW (CR)	LB/HR	N/A		N/A					0 00				
PRIMARY AIR DIFF (CR)	IN WG	N/A		N/A					0 00				
PRIMARY AIR DIFF (MAN)	IN WG	2.460		2 450					2 455				
PA PLENUM PRESS (CR)	IN WG	43 3		43 1					43.20				
LOW SIDE PA DIFF STATIC(MAN)	IN WG	38 5		38					38.25				
PA DAMPER POSITION	%	64		64					64 00				
HISIDE MILL DIFF STATIC(K61)SID	IN WG	N/A		N/A					0 00				
WINDBOX SIDE STATIC (K60L)	IN WG	8 9		9 1					9.00				
WINDBOX SIDE TEMP (K60L)	F	94.6		94 2					94.40				
WINDBOX SIDE STATIC (K60R)	IN WG	N/A		N/A					0 00				
MILL DIFF (CR) K61-K62	IN WG	N/A		N/A					0 00				
MILL DIFF (MAN) K61-K62	IN WG	2.800		3 200					3 000				
LOSIDE MILL DIFF STATIC(K62)	IN WG	4 4		4.3					4 35				
BURNER PIPE STATIC (BPS)	IN WG	N/A		N/A					0 00				
CLASSIFIER DIFF (K62-BPS)	IN WG	3.3		3 3					3 30				
MILL DIFFERENTIAL (K60-K62)	IN WG	4 5		4 5					4 50				
MILL INLET AIR TEMP (CR)	F	92		92					92 00				
MILL OUTLET AIR TEMP (CR)	F	92		92					92 00				
AIR TEMP AT TRAVERSE	F	70		69		68		68		68		68	
STATIC PRESSURE AT TRAVERSE	IN WG	1 05		1 15		1 10		1 10		1 05		1 10	
BURNER PIPE TRAVERSE NUMBE	*	1		2		3		4		5		6	
PITOT TUBE READINGS		Ho	SQRT(Ho)	Ho	SQRT(Ho)	Ho	SQRT(Ho)	Ho	SQRT(Ho)	Ho	SQRT(Ho)	Ho	SQRT(Ho)
1	IN WG	0 717	0 85	0 554	0 74	0 800	0 89	0.549	0 74	0.776	0 88	0 883	0.94
2	IN WG	0.830	0 91	0 910	0 95	0.964	0 98	0 815	0 90	0.898	0.95	1.071	1 03
3	IN WG	0 883	0 94	0 983	0.99	0.971	0 99	0 852	0 92	1.069	1 03	1 135	1 07
4	IN WG	0 947	0 97	1 003	1 00	0.920	0 96	0.832	0 91	1 025	1 01	1 120	1 06
5	IN WG	0 993	1 00	0 983	0 99	0 962	0 98	0 861	0 93	1.054	1 03	1.091	1 04
6	IN WG	1 047	1.02	1 010	1 00	1 030	1 01	0 913	0 96	1 101	1 05	1.067	1 03
7	IN WG	1 088	1 04	1 071	1.03	1 101	1 05	1 047	1 02	1 115	1.06	0.981	0 99
8	IN WG	1 088	1 04	1 093	1.05	1 098	1.05	1 086	1 04	1 128	1.06	1.001	1 00
9	IN WG	1 110	1 05	1 084	1 04	1 093	1 05	1 093	1 05	1.123	1.06	1.180	1 09
10	IN WG	1 086	1 04	1 084	1.04	1 096	1 05	1 096	1 05	1 125	1.06	1.035	1 02
11	IN WG	1 049	1 02	1 040	1 02	1.032	1 02	1 047	1 02	1 062	1 03	1 040	1 02
12	IN WG	0 903	0 95	0 969	0 98	0 861	0 93	0 918	0 96	0 930	0.96	0.908	0.95
1	IN WG	0 730	0 85	0 913	0 96	0 864	0 93	0.854	0 92	0.778	0.88	0 905	0 95
2	IN WG	1 020	1 01	1 037	1 02	1 037	1 02	1 025	1.01	1 071	1 03	1 086	1 04
3	IN WG	1 064	1 03	1 071	1 03	1 093	1 05	1 052	1 03	1.130	1 06	1 132	1 06
4	IN WG	1.062	1 03	1.067	1 03	1.101	1 05	1.067	1.03	1.128	1 06	1 128	1 06
5	IN WG	1 062	1 03	1 064	1.03	1.093	1 05	1 049	1.02	1.132	1 06	1 106	1 05
6	IN WG	1 057	1 03	1 079	1 04	1 084	1 04	1 042	1 02	1 115	1 06	1 064	1 03
7	IN WG	1 071	1 03	1 013	1 01	1 049	1 02	0 983	0 99	1 062	1 03	0 979	0 99
8	IN WG	1 054	1 03	0 930	0 96	0 979	0 99	0 971	0 99	0 986	0 99	0 935	0 97
9	IN WG	1 035	1 02	0 974	0 99	0 947	0 97	0 983	0 99	0 966	0.98	0.910	0 95
10	IN WG	1 027	1 01	0 952	0.98	0 957	0 98	0 981	0 99	0 910	0 95	0 903	0.95
11	IN WG	0.954	0 98	0 852	0 92	0 878	0 94	0 920	0 96	0 861	0 93	0 852	0.92
12	IN WG	0.857	0.93	0 793	0 89	0 783	0 88	0 793	0 89	0 749	0 87	0 754	0 87
SUM OF SQRT Ho			23 826		23 713		23.866		23 350		24 100		24.098
AVG SQRT Ho			0 993		0 988		0 994		0 973		1 004		1 004
AIR INLET DENSITY (di)	LB/FT3		0 0682		0 0682		0 0682		0 0682		0 0682		0.0682
AIR DENSITY AT OUTLET, (do)	LB/FT3		0 0642		0 0644		0.0645		0 0645		0 0645		0.0645
SQRT do			0 2534		0 2537		0 2539		0.2539		0.2539		0.2539
PIPE I D	IN		21 00		21 00		21 00		21 00		21 00		21 00
BURNER PIPE AREA (A)	FT^2		2 405		2 405		2.405		2 405		2 405		2 405
VELOCITY (V)=1096*(Ho/do)^ 5	FT/MIN		4294		4269		4292		4200		4335		4334
VOLUME FLOW (Qo) Qo=V*A	FT^3/MIN		10328		10268		10325		10101		10426		10425
MASS FLOW (W) W=Qo*do	LB/MIN		663 19		660 77		665 60		651 21		672 07		672 06
SQRT (H1 * di)			0 409		0.409		0 409		0 409		0 409		0 409
K= W/ (SQRT H1*di)			1620		1614		1626		1591		1642		1642
SUM OF K			9736		9736		9736		9736		9736		9736
TOTAL VOLUME FLOW(Qo)Qo=V*A	FT^3/MIN		61873										
TOTAL MASS FLOW (W) W=Qo*do	LB/HR		239094										
INLET VOLUME FLOW	FT^3/MIN		58393										
LOWEST K			1591		1591		1591		1591		1591		1591
% DEV FROM LOWEST K			1 84		1.47		2.21		0 00		3 20		3.20
AVG K			1623		1623		1623		1623		1623		1623
% DEV FROM AVG K			-0 14		-0 51		0.22		-1 95		1 19		1 19

USTOMER	INTERMOUNTAIN POWER												
NT	INTERMOUNTAIN												
TRACT NO	RB-615		(FILE ID 2HCLEAN.WK4)										
RFORMED BY	GN KIRK, DR DOUGAN, NS MOEN												
DATE	MO/DAY/YR		3/10/98						TEST				
TIME	HOURS	1915		2008					AVG				
PULVERIZER NUMBER.	#	2H		2H					2H				
BAROMETRIC PRESSURE	IN Hg	25 60		25.60					25.60				
PRIMARY AIR FLOW (CR)	%	100		100					100 00				
PRIMARY AIR FLOW (CR)	LB/HR	N/A		N/A					0 00				
PRIMARY AIR DIFF (CR)	IN WG	N/A		N/A					0 00				
PRIMARY AIR DIFF (MAN)	IN WG	3 10		3.08					3 09				
PA PLENUM PRESS (CR)	IN WG	43		43					43 00				
LOW SIDE PA DIFF STATIC(MAN)	IN WG	37		36 8					36.90				
PA DAMPER POSITION	%	68		68					68 00				
HISIDE MILL DIFF STATIC(K61)SID	IN WG	N/A		N/A					0 00				
WINDBOX SIDE STATIC (K60L)	IN WG	12 0		12 1					12.05				
WINDBOX SIDE TEMP (K60L)	F	93 8		93 4					93 60				
WINDBOX SIDE STATIC (K60R)	IN WG	N/A		N/A					0.00				
MILL DIFF (CR) K61-K62	IN WG	N/A		N/A					0 00				
MILL DIFF (MAN) K61-K62	IN WG	3 90		3 90					3 90				
LOSIDE MILL DIFF STATIC(K62)	IN WG	5 9		6 1					6 00				
BURNER PIPE STATIC (BPS)	IN WG	N/A		N/A					0 00				
CLASSIFIER DIFF (K62-BPS)	IN WG	4 2		4 2					4.20				
MILL DIFFERENTIAL (K60-K62)	IN WG	6		6 1					6 05				
MILL INLET AIR TEMP (CR)	F	92		92					92 00				
MILL OUTLET AIR TEMP (CR)	F	92		92					91 60				
AIR TEMP AT TRAVERSE	F	73		74		74		73		72		70	
STATIC PRESSURE AT TRAVERSE	IN WG	1 35		1 30		1 35		1 35		1.40		1 45	
BURNER PIPE TRAVERSE NUMBE	*	1		2		3		4		5		6	
PITOT TUBE READINGS		Ho	SQRT(Ho)	Ho	SQRT(Ho)	Ho	SQRT(Ho)	Ho	SQRT(Ho)	Ho	SQRT(Ho)	Ho	SQRT(Ho)
1	IN WG	1 130	1.06	1 103	1 05	1.120	1 06	0 788	0 89	1 037	1 02	1 176	1 08
2	IN WG	1 276	1 13	1 294	1 14	1 306	1.14	1.259	1.12	1.340	1 16	1 347	1 16
3	IN WG	1 323	1 15	1 352	1 16	1.374	1 17	1 335	1 16	1 401	1 18	1 401	1.18
4	IN WG	1 323	1 15	1.362	1.17	1 379	1 17	1.311	1 14	1 403	1 18	1 416	1 19
5	IN WG	1 338	1 16	1 362	1 17	1 359	1 17	1 284	1 13	1 416	1 19	1 362	1 17
6	IN WG	1 335	1 16	1 345	1 16	1 364	1.17	1 262	1 12	1.394	1.18	1 298	1 14
7	IN WG	1 345	1 16	1 333	1 15	1 311	1 14	1 225	1 11	1.355	1 16	1 193	1 09
8	IN WG	1 330	1 15	1 284	1 13	1 257	1.12	1 235	1 11	1.296	1 14	1 159	1.08
9	IN WG	1 279	1 13	1.211	1 10	1 206	1 10	1.264	1.12	1 233	1 11	1.128	1.06
10	IN WG	1 284	1 13	1 167	1 08	1 211	1 10	1 235	1 11	1 176	1 08	1 130	1 06
11	IN WG	1 162	1.08	1 084	1 04	1 106	1.05	1.181	1 09	1 046	1 02	1.110	1 05
12	IN WG	1.040	1 02	0.908	0 95	0.996	1.00	1 037	1 02	0 993	1 00	1 018	1.01
1	IN WG	0 871	0 93	0 695	0 83	0.664	0 81	0 761	0 87	0 881	0 94	0 871	0 93
2	IN WG	1.074	1 04	1 020	1 01	1 142	1 07	1 013	1 01	1.069	1 03	1 359	1 17
3	IN WG	1 167	1 08	1 150	1 07	1 235	1 11	1 074	1 04	1.303	1 14	1 408	1 19
4	IN WG	1.223	1.11	1 193	1 09	1 323	1 15	1 086	1 04	1 308	1 14	1 394	1 18
5	IN WG	1 258	1 12	1 298	1.14	1 240	1.11	1 150	1 07	1 374	1 17	1 362	1 17
6	IN WG	1 301	1 14	1 274	1.13	1 325	1 15	1 174	1.08	1 399	1.18	1.330	1.15
7	IN WG	1 367	1 17	1 350	1 16	1 364	1 17	1.352	1 16	1 425	1 19	1 211	1 10
8	IN WG	1 396	1 18	1 372	1.17	1 379	1 17	1.367	1 17	1 435	1.20	1.235	1 11
9	IN WG	1.398	1 18	1.379	1 17	1 374	1 17	1 394	1 18	1 430	1.20	1.264	1 12
10	IN WG	1 364	1 17	1 364	1 17	1 384	1 18	1 369	1 17	1 435	1 20	1 301	1 14
11	IN WG	1.350	1 16	1 313	1 15	1 294	1 14	1 291	1 14	1 347	1 16	1 286	1 13
12	IN WG	1 115	1 06	1 169	1 08	0.949	0.97	1 123	1 06	1 108	1 05	1 189	1 09
SUM OF SQRT Ho			26 817		26 486		26 608		26 117		27 043		26.769
AVG SQRT Ho			1 117		1 104		1 109		1 088		1 127		1 115
AIR INLET DENSITY (di)	LB/FT3		0 0681		0 0681		0.0681		0 0681		0.0681		0.0681
AIR DENSITY AT OUTLET, (do)	LB/FT3		0 0640		0 0639		0 0639		0 0640		0 0641		0 0644
SQRT do			0 2530		0 2527		0 2528		0.2530		0.2533		0 2537
PIPE I.D.	IN		21 00		21 00		21 00		21.00		21 00		21 00
BURNER PIPE AREA (A)	FT^2		2 405		2 405		2 405		2 405		2 405		2 405
VELOCITY (V)=1096*(Ho/do)^ 5	FT/MIN		4841		4786		4807		4714		4876		4818
VOLUME FLOW (Qo) Qo=V*A	FT^3/MIN		11643		11511		11563		11339		11729		11588
MASS FLOW (W) W=Qo*do	LB/MIN		745 23		735 28		738.73		725 79		752 26		746 11
SQRT (H1 * di)			0 459		0.459		0 459		0 459		0 459		0 459
K= W/ (SQRT H1*di)			1625		1603		1610		1582		1640		1626
SUM OF K			9686		9686		9686		9686		9686		9686
TOTAL VOLUME FLOW(Qo)Qo=V*A	FT^3/MIN		69372										
TOTAL MASS FLOW (W) W=Qo*do	LB/HR		266603										
INLET VOLUME FLOW	FT^3/MIN		65249										
LOWEST K			1582		1582		1582		1582		1582		1582
% DEV. FROM LOWEST K			2 68		1.31		1 78		0 00		3 65		2 80
AVG K			1614		1614		1614		1614		1614		1614
% DEV FROM AVG K			0 63		-0 71		-0 25		-2.00		1 58		0 75

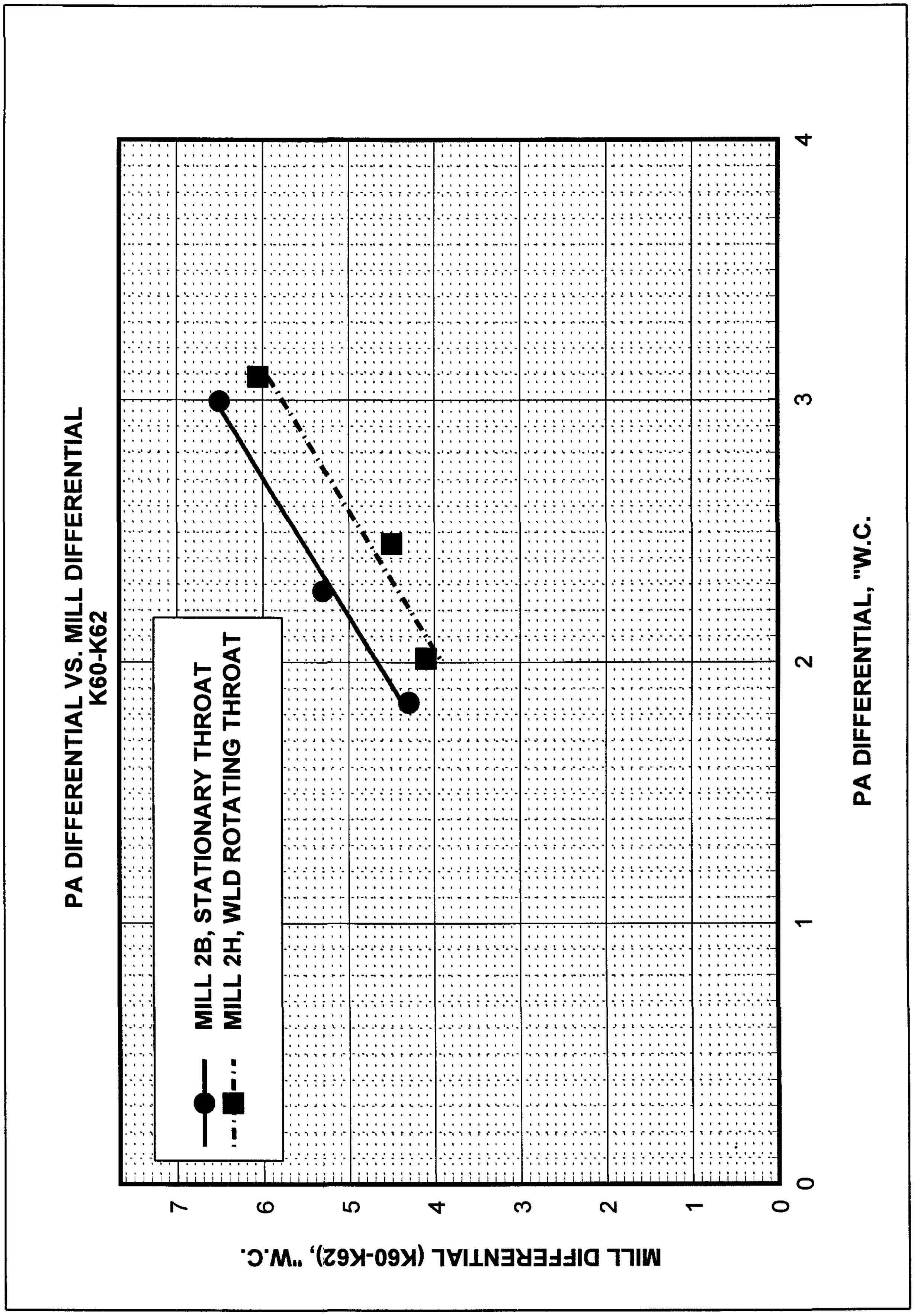
IP7_038736

FIGURE 1-7



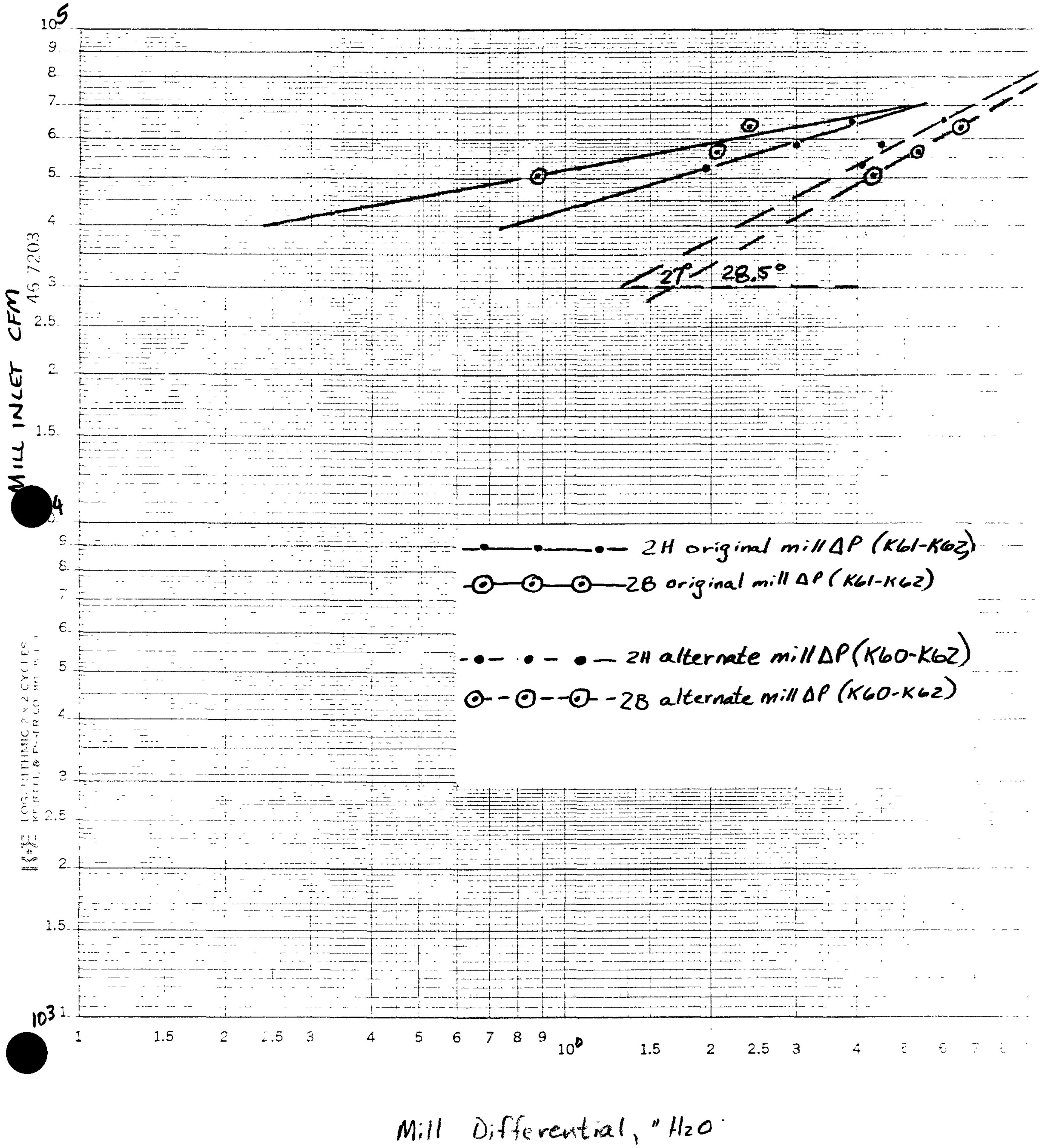
PADPK61 May 18, 1998 9:42:59 AM

FIGURE 1-8



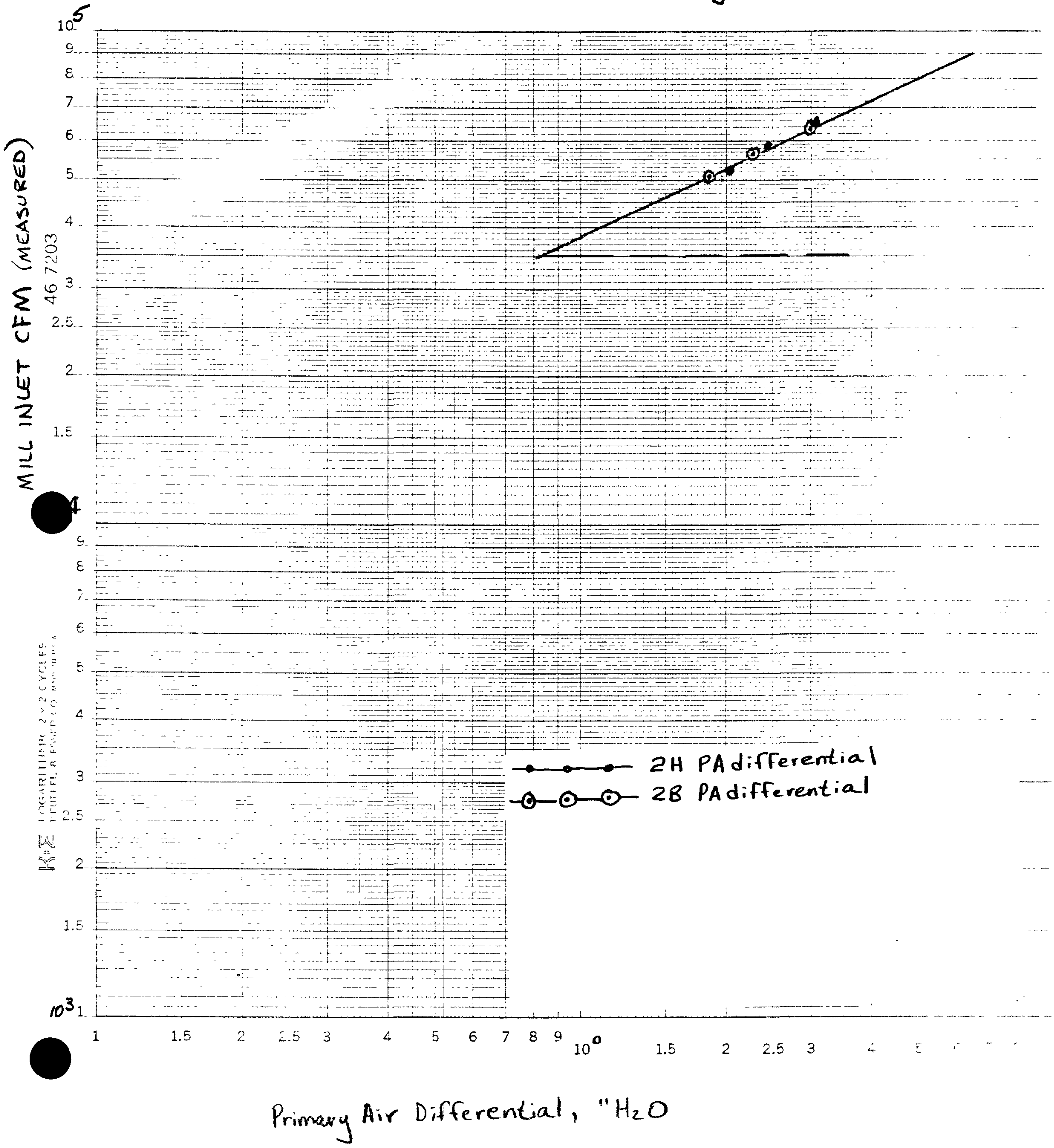
PADPK60 May 18, 1998 9:47:54 AM

Figure 1-9



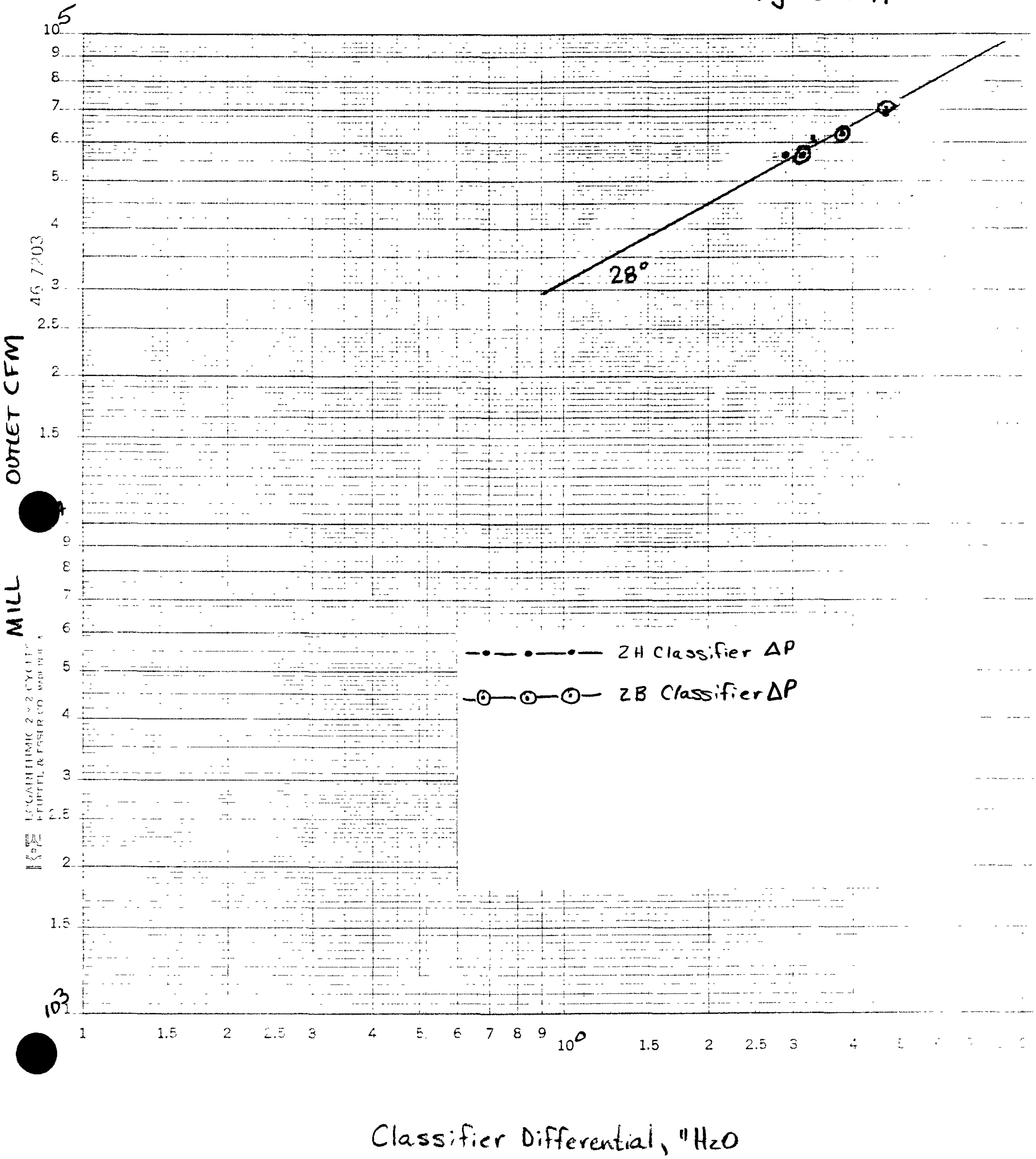
IP7_038739

Figure 1-10



MILL INLET CFM (MEASURED)
2H PA differential
2B PA differential
Primary Air Differential, "H2O

Figure 1-11



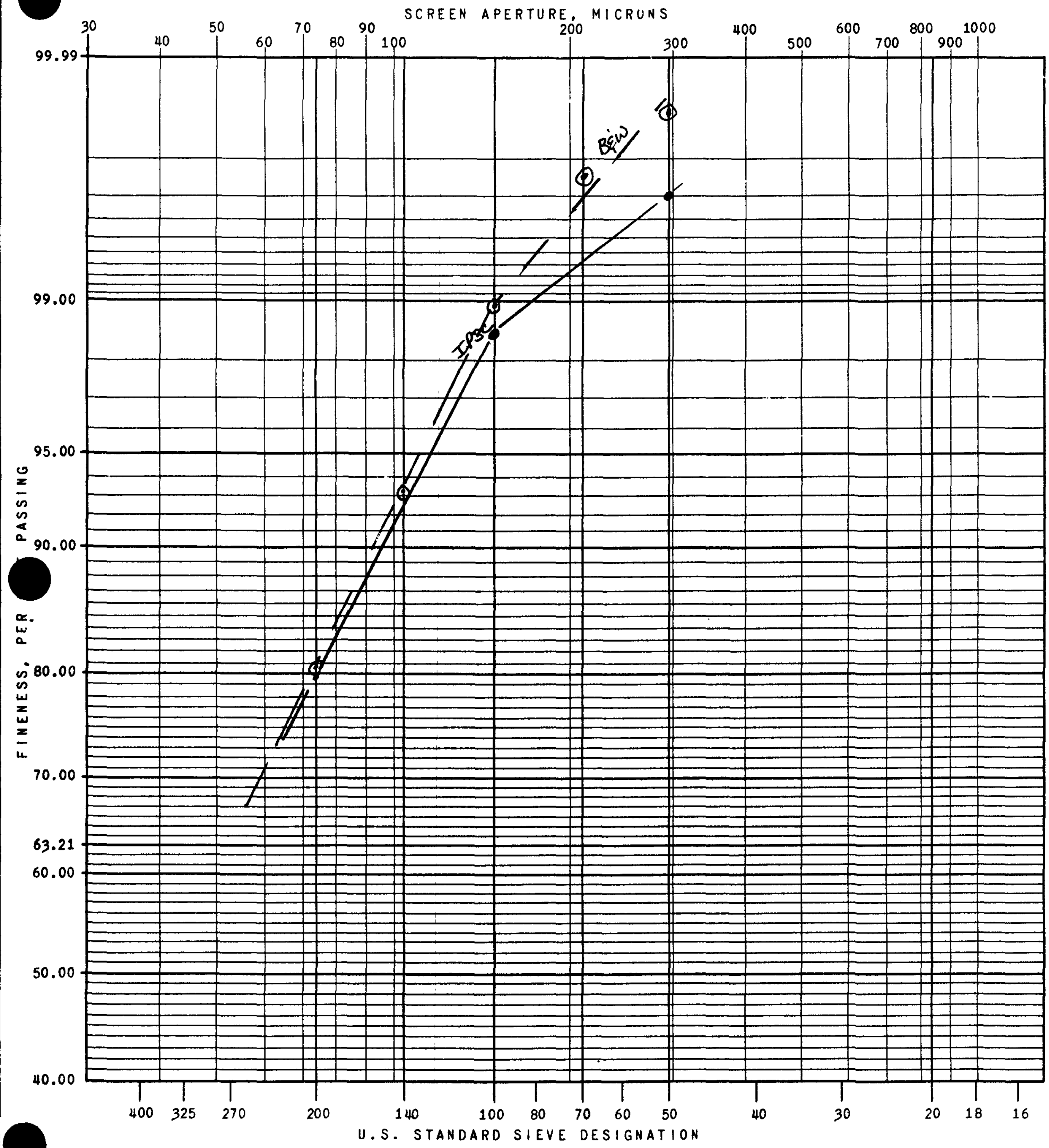
IP7_038741

CUSTOMER:	LOCATION	IPP							
PLANT:		Intermountain							
CONTRACT NO.:		RB-614		(FILE ID:2BSTAIPP.WK4)					
PERFORMED BY:		GN KIRK, DR DOUGAN, NS MOEN							
TEST NUMBER			1		1		TEST		
DATE		MO/DAY/YR	3/11/98		3/11/98		AVERAGE		
TIME		HOURS	1030		1130				
PULVERIZER NUMBER:		#	2B		2B				
BAROMETRIC PRESSURE	CONTROL ROOM	IN Hg	25.58		25.58		25.58		
COAL FLOW (CONTROL ROOM)	CR	%	70.00		70.00		70.00		
COAL FLOW (CONTROL ROOM)	CR	LB/HR	96000		96000		96000		
PRIMARY AIR BIAS	CR	%	0.0		0.0		0.0		
PRIMARY AIR FLOW	CR	%	87.00		88.00		87.50		
PRIMARY AIR DIFF.	CR	IN WG	N/A		N/A		N/A		
PRIMARY AIR DIFF.	MANOMETER	IN WG	3.12		3.10		3.11		
MILL DIFF (K61-K62)	CR	IN WG	11.00		12.00		11.50		
MILL DIFF (K61-K62)	MANOMETER	IN WG	10.8		11.3		11.05		
LOSIDE MILL DIFF STATIC	(K62 MAN)	IN WG	10.7		10.7		10.7		
PRIMARY AIR PLENUM PRESSURE	CR	IN WG	43.2		43.2		43.2		
WINDBOX SIDE STATIC (K60L)	MANOMETER	IN WG	25.4		26		25.7		
WINDBOX-LOSIDE DIFF(K60-K62)	CALCULATED	IN WG	14.7		15.3		15.0		
WINDBOX-LOSIDE DIFF(K60-K62)	MANOMETER	IN WG	14.8		15.0		14.9		
TURRET STATIC (TSP)	MANOMETER	IN WG	5.4		5.6		5.5		
CLASSIFIER DIFF (K62-TSP)	CALCULATED	IN WG	5.3		5.1		5.2		
CLASSIFIER DIFF (K62-TSP)	MANOMETER	IN WG	5.4		5.4		5.4		
MILL INLET AIR TEMP	CR	F	303		303		303		
MILL OUTLET AIR TEMP	CR	F	148		148		148		
AIR TEMP @ K60L	TC	F	303		311		307		
K FACTOR	#		9698		9698		9698		
CALC INLET AIR DENSITY (di)	CALCULATED	LB/FT3	0.04940		0.04884		0.04912		
CALC OUTLET AIR DENSITY (do)	CALCULATED	LB/FT3	0.05672		0.05675		0.05673		
CALC PRI AIR FLOW ENTRG MILL	CALCULATED	CFM	77071		77266		77168		
CALC PRI AIR MASS FLOW (IN CONTROLS)	CURVES	LB/HR	201600		201600		201600		
CALC PRI AIR MASS FLOW	CALCULATED	LB/HR	228443		226408		227426		
CALC PRI AIR FLOW LVG MILL	CALCULATED	CFM	67130		66495		66813		
PULVERIZER THROAT AREA	CALCULATED	FT^2	4.98		4.98		4.98		
PULVERIZER THROAT VELOCITY	CALCULATED	FPM	15476		15515		15496		
VERTICAL THROAT VELOCITY	CALCULATED	FPM	7738		7758		7748		
BURNER PIPE I.D.@TRAVERSE	MEASURED	INCHES	21.0		21.0		21.0		
CALC BURNER LINE AREA	CALCULATED	FT2	2.4053		2.4053		2.4053		
CALC AVERAGE BURNER LINE VELOCITY	CALCULATED	FPM	4652		4608		4630		
AIR/FUEL RATIO (AT INLETS)	CALCULATED	FT^3/LB	48.17		48.29		48.23		
AIR/FUEL RATIO (AT INLETS)	CALCULATED	LB/LB	2.38		2.36		2.37		
AIR/FUEL RATIO (AT OUTLET)	CALCULATED	FT^3/LB	41.96		41.56		41.76		
FUEL/AIR RATIO (AT INLET)	CALCULATED	LB/LB	0.42		0.42		0.42		
CLASSIFIER VANE LENGTH	MEASURED	IN		VANE LENGTH = 19 3/4"					
HYDRAULIC LOADING PRESSURE	MEASURED	PSIG	2150		2150		2150		
SPRING PRESSURE	CALCULATED	TONS/ROLL	25		25		25		
LOSIDE PITOT TUBE STATIC	MANOMETER	IN WG	38.3		37.9		38.1		
PYRITES REJECT RATE	HOPPER		NONE						
MILL OPERATION	OBSERVED	SMOOTH/ROUGH	SMOOTH						
PULV MOTOR CURRENT	CR	AMPS	68.0		67.0		67.5		
PULV MOTOR BUSS VOLTAGE	WATTMETER	VOLTS					6963		
AVG. MOTOR INPUT KVA	WATTMETER						817		
AVG. MOTOR INPUT POWER, KVAR	WATTMETER						569		
AVG. MOTOR INPUT POWER, KW (HP)	WATTMETER	KW (HP)					586.3(785.9)		
MOTOR POWER FACTOR	WATTMETER						0.71		
MILL INPUT POWER, KW (HP)	CALCULATED	KW (HP)					542.9(727.7)		
GRINDING ELEMENT AGE		10 MTHS		8319 HRS					
HA DAMPER POSITION	CR	%	45.0		45.0		45.0		
CA DAMPER POSITION	CR	%	55.0		55.0		55.0		
PA DAMPER POSITION	CR	%	64.8		66.5		65.7		
BURNER PIPE TRAVERSE NUMBER			1	2	3	4	5	6	
ORIFICE SIZE / ASPIRATING AIR PRESSURE					7" ASPIRATING				
SAMPLE WEIGHT		GRAMS	416.3	340.6	398.2	507.6	406.6	436.9	
AVERAGE SAMPLE WEIGHT		GRAMS			417.7				
% RECOVERY, PIPE		%	98.51	80.60	94.23	120.11	96.21	103.38	
% RECOVERY, PULV AVG		%			98.84				
SAMPLE IDENTIFICATION									
SIEVE ANALYSIS		COMPANY	IPSC	B&W					
% PASSING 50 MESH		%	99.8	99.94					
% PASSING 70 MESH		%		99.86					
% PASSING 100 MESH		%	98.5	98.98					
% PASSING 140 MESH		%		93.10					
% PASSING 200 MESH		%	79.8	80.70					
PULVERIZED COAL SURFACE MOISTURE		%							
RAW COAL TOTAL MOISTURE		%	7.55						
RAW COAL SURFACE MOISTURE		%	6.3						
RAW COAL GRINDABILITY		HGI	48.9						

BDS-1125

BABCOCK & WILCOX

Figure 2-2



PLOT OF ROSIN AND RAMMLER EQUATION FOR USE WITH PULVERIZED COAL

CUSTOMER Intermountain Power	JOB NO. RB-615
SUBJECT Mill 2B fineness at 70% fdr spd on "good" coal	
	BY NSMoen
	DATE 3/19/98

IP7_038743

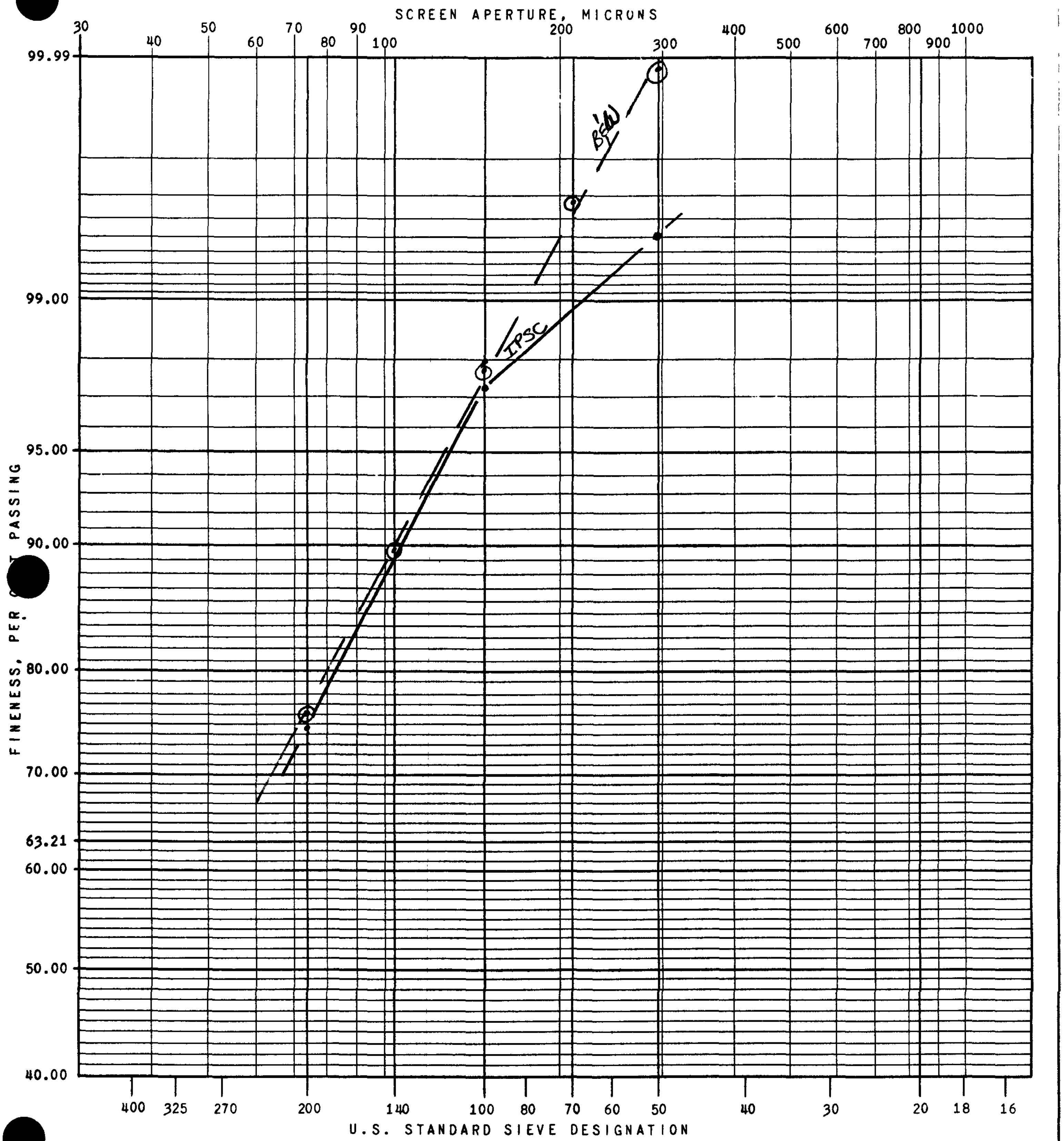
STOMER:	LOCATION	IPP							
PLANT:		Intermountain							
CONTRACT NO.:		RB-614		(FILE ID:2BSTAIPP.WK4)					
PERFORMED BY:		GN KIRK, DR DOUGAN, NS MOEN							
TEST NUMBER			2		2		TEST		
DATE		MO/DAY/YR	3/11/98		3/11/98		AVERAGE		
TIME		HOURS	1240		1315				
PULVERIZER NUMBER:		#	2B		2B				
BAROMETRIC PRESSURE	CONTROL ROOM	IN Hg	25.58		25.58		25.58		
COAL FLOW (CONTROL ROOM)	CR	%	85.00		85.00		85.00		
COAL FLOW (CONTROL ROOM)	CR	LB/HR	116000		116000		116000		
PRIMARY AIR BIAS	CR	%	0.0		0.0		0.0		
PRIMARY AIR FLOW	CR	%	94.00		94.00		94.00		
PRIMARY AIR DIFF.	CR	IN WG	N/A		N/A		N/A		
PRIMARY AIR DIFF.	MANOMETER	IN WG	3.69		3.69		3.69		
MILL DIFF (K61-K62)	CR	IN WG	15.00		15.00		15.00		
MILL DIFF (K61-K62)	MANOMETER	IN WG	15.9		15.9		15.90		
LOSIDE MILL DIFF STATIC	(K62 MAN)	IN WG	13.2		13.2		13.2		
PRIMARY AIR PLENUM PRESSURE	CR	IN WG	44.2		44.2		44.2		
WINDBOX SIDE STATIC (K60L)	MANOMETER	IN WG	31.8		31.8		31.8		
WINDBOX-LOSIDE DIFF(K60-K62)	CALCULATED	IN WG	18.6		18.6		18.6		
WINDBOX-LOSIDE DIFF(K60-K62)	MANOMETER	IN WG	18.7		18.7		18.7		
TURRET STATIC (TSP)	MANOMETER	IN WG	5.4		5.4		5.4		
CLASSIFIER DIFF (K62-TSP)	CALCULATED	IN WG	7.8		7.8		7.8		
CLASSIFIER DIFF (K62-TSP)	MANOMETER	IN WG	5.9		5.9		5.9		
MILL INLET AIR TEMP	CR	F	337		337		337		
MILL OUTLET AIR TEMP	CR	F	148		148		148		
AIR TEMP @ K60L	TC	F	325		325		325		
K FACTOR	#		9698		9698		9698		
CALC INLET AIR DENSITY (di)	CALCULATED	LB/FT3	0.04779		0.04792		0.04785		
CALC OUTLET AIR DENSITY (do)	CALCULATED	LB/FT3	0.05672		0.05672		0.05672		
CALC PRI AIR FLOW ENTRG MILL	CALCULATED	CFM	85215		85104		85160		
CALC PRI AIR MASS FLOW (IN CONTROLS)	CURVES	LB/HR	216000		216000		216000		
CALC PRI AIR MASS FLOW	CALCULATED	LB/HR	244358		244675		244517		
CALC PRI AIR FLOW LVG MILL	CALCULATED	CFM	71807		71900		71854		
PULVERIZER THROAT AREA	CALCULATED	FT^2	4.98		4.98		4.98		
PULVERIZER THROAT VELOCITY	CALCULATED	FPM	17111		17089		17100		
VERTICAL THROAT VELOCITY	CALCULATED	FPM	8556		8545		8550		
BURNER PIPE I.D.@TRAVERSE	MEASURED	INCHES	21.0		21.0		21.0		
LC BURNER LINE AREA	CALCULATED	FT2	2.4053		2.4053		2.4053		
LC AVERAGE BURNER LINE VELOCITY	CALCULATED	FPM	4976		4982		4979		
IR/FUEL RATIO (AT INLETS)	CALCULATED	FT^3/LB	44.08		44.02		44.05		
AIR/FUEL RATIO (AT INLETS)	CALCULATED	LB/LB	2.11		2.11		2.11		
AIR/FUEL RATIO (AT OUTLET)	CALCULATED	FT^3/LB	37.14		37.19		37.17		
FUEL/AIR RATIO (AT INLET)	CALCULATED	LB/LB	0.47		0.47		0.47		
CLASSIFIER VANE LENGTH	MEASURED	IN		VANE LENGTH = 19 3/4"					
HYDRAULIC LOADING PRESSURE	MEASURED	PSIG	2400		2400		2400		
SPRING PRESSURE	CALCULATED	TONS/ROLL	28		28		28		
LOSIDE PITOT TUBE STATIC	MANOMETER	IN WG	36.5		37.5		37.0		
PYRITES REJECT RATE	HOPPER		NONE						
MILL OPERATION	OBSERVED	SMOOTH/ROUGH	SMOOTH						
PULV MOTOR CURRENT	CR	AMPS	70.0		70.0		70.0		
PULV MOTOR BUSS VOLTAGE	WATTMETER	VOLTS					6961		
AVG. MOTOR INPUT KVA	WATTMETER						843		
AVG. MOTOR INPUT POWER, KVAR	WATTMETER						577		
AVG. MOTOR INPUT POWER, KW (HP)	WATTMETER	KW (HP)					615.1(824.5)		
MOTOR POWER FACTOR	WATTMETER						0.73		
MILL INPUT POWER, KW (HP)	CALCULATED	KW (HP)					569.6(763.5)		
GRINDING ELEMENT AGE		10 MTHS		8321 HRS					
HA DAMPER POSITION	CR	%	47.0		47.0		47.0		
CA DAMPER POSITION	CR	%	53.0		53.0		53.0		
PA DAMPER POSITION	CR	%	74.2		74.2		74.2		
BURNER PIPE TRAVERSE NUMBER			A	B	C	D	E	F	
ORIFICE SIZE / ASPIRATING AIR PRESSURE									
SAMPLE WEIGHT		GRAMS							
TIME SAMPLED									
% RECOVERY, PIPE		%							
% RECOVERY, PULV AVG		%							
SAMPLE IDENTIFICATION									
SIEVE ANALYSIS		COMPANY	IPSC						
% PASSING 50 MESH		%							
% PASSING 70 MESH		%							
% PASSING 100 MESH		%							
% PASSING 140 MESH		%							
% PASSING 200 MESH		%							
PULVERIZED COAL SURFACE MOISTURE		%							
AW COAL TOTAL MOISTURE		%							
AW COAL SURFACE MOISTURE		%							
AW COAL GRINDABILITY		HGI							

CUSTOMER:	LOCATION	IPP							
PLANT:		Intermountain							
CONTRACT NO.:		RB-614		(FILE ID:2BSTAIPP.WK4)					
PERFORMED BY:		GN KIRK, DR DOUGAN, NS MOEN							
TEST NUMBER			3		3		TEST		
DATE		MO/DAY/YR	3/11/98		3/11/98		AVERAGE		
TIME		HOURS	1340		1430				
PULVERIZER NUMBER:		#	2B		2B				
BAROMETRIC PRESSURE	CONTROL ROOM	IN Hg	25.55		25.55		25.55		
COAL FLOW (CONTROL ROOM)	CR	%	95.00		94.00		94.50		
COAL FLOW (CONTROL ROOM)	CR	LB/HR	127880		129160		128520		
PRIMARY AIR BIAS	CR	%	0.0		0.0		0.0		
PRIMARY AIR FLOW	CR	%	97.00		99.00		98.00		
PRIMARY AIR DIFF.	CR	IN WG	N/A		N/A		N/A		
PRIMARY AIR DIFF.	MANOMETER	IN WG	4.23		4.11		4.17		
MILL DIFF (K61-K62)	CR	IN WG	22.50		22.50		22.50		
MILL DIFF (K61-K62)	MANOMETER	IN WG	22.2		22.7		22.45		
LOSIDE MILL DIFF STATIC	(K62 MAN)	IN WG	14.9		15.0		15.0		
PRIMARY AIR PLENUM PRESSURE	CR	IN WG	43.1		43.1		43.1		
WINDBOX SIDE STATIC (K60L)	MANOMETER	IN WG	38		38.5		38.3		
WINDBOX-LOSIDE DIFF(K60-K62)	CALCULATED	IN WG	23.1		23.5		23.3		
WINDBOX-LOSIDE DIFF(K60-K62)	MANOMETER	IN WG	22.1		23.4		22.8		
TURRET STATIC (TSP)	MANOMETER	IN WG	7.6		8.0		7.8		
CLASSIFIER DIFF (K62-TSP)	CALCULATED	IN WG	7.3		7.0		7.2		
CLASSIFIER DIFF (K62-TSP)	MANOMETER	IN WG	6.9		6.4		6.7		
MILL INLET AIR TEMP	CR	F	341		335		338		
MILL OUTLET AIR TEMP	CR	F	149		148		148		
AIR TEMP @ K60L	TC	F	316		320		318		
K FACTOR	#		9698		9698		9698		
CALC INLET AIR DENSITY (di)	CALCULATED	LB/FT3	0.04836		0.04805		0.04820		
CALC OUTLET AIR DENSITY (do)	CALCULATED	LB/FT3	0.05695		0.05707		0.05701		
CALC PRI AIR FLOW ENTRG MILL	CALCULATED	CFM	90702		89695		90198		
CALC PRI AIR MASS FLOW (IN CONTROLS)	CURVES	LB/HR	230400		230400		230400		
CALC PRI AIR MASS FLOW	CALCULATED	LB/HR	263172		258578		260875		
CALC PRI AIR FLOW LVG MILL	CALCULATED	CFM	77021		75517		76269		
PULVERIZER THROAT AREA	CALCULATED	FT^2	4.98		4.98		4.98		
PULVERIZER THROAT VELOCITY	CALCULATED	FPM	18213		18011		18112		
VERTICAL THROAT VELOCITY	CALCULATED	FPM	9107		9005		9056		
BURNER PIPE I.D.@TRAVERSE	MEASURED	INCHES	21.0		21.0		21.0		
CALC BURNER LINE AREA	CALCULATED	FT2	2.4053		2.4053		2.4053		
CALC AVERAGE BURNER LINE VELOCITY	CALCULATED	FPM	5337		5233		5285		
AIR/FUEL RATIO (AT INLETS)	CALCULATED	FT^3/LB	42.56		41.67		42.11		
AIR/FUEL RATIO (AT INLETS)	CALCULATED	LB/LB	2.06		2.00		2.03		
AIR/FUEL RATIO (AT OUTLET)	CALCULATED	FT^3/LB	36.14		35.08		35.61		
FUEL/AIR RATIO (AT INLET)	CALCULATED	LB/LB	0.49		0.50		0.49		
CLASSIFIER VANE LENGTH	MEASURED	IN		VANE LENGTH = 19 3/4"					
HYDRAULIC LOADING PRESSURE	MEASURED	PSIG	2400		2400		2400		
SPRING PRESSURE	CALCULATED	TONS/ROLL	28		28		28		
LOSIDE PITOT TUBE STATIC	MANOMETER	IN WG	37.0		36.5		36.8		
PYRITES REJECT RATE	HOPPER		1 BOX FULL PER 10 MINUTES						
MILL OPERATION	OBSERVED	MOOTH/ROUG	SMOOTH						
PULV MOTOR CURRENT	CR	AMPS	72.0		76.0		74.0		
PULV MOTOR BUSS VOLTAGE	WATTMETER	VOLTS					6954		
AVG. MOTOR INPUT KVA	WATTMETER						879		
AVG. MOTOR INPUT POWER, KVAR	WATTMETER						590		
AVG. MOTOR INPUT POWER, KW (HP)	WATTMETER	KW (HP)					651.7(873.6)		
MOTOR POWER FACTOR	WATTMETER						0.73		
MILL INPUT POWER, KW (HP)	CALCULATED	KW (HP)					604(809.7)		
GRINDING ELEMENT AGE		10 MTHS		8322 HRS					
HA DAMPER POSITION	CR	%	50.0		50.0		50.0		
CA DAMPER POSITION	CR	%	50.0		50.0		50.0		
PA DAMPER POSITION	CR	%	100.0		100.0		100.0		
BURNER PIPE TRAVERSE NUMBER			A	B	C	D	E	F	
ORIFICE SIZE / ASPIRATING AIR PRESSURE					6.5" ASPIRATING				
SAMPLE WEIGHT		GRAMS	537.8	448.4	565.5	525.5	600.7	498.5	
TIME SAMPLED					529.4				
% RECOVERY, PIPE		%	93.21	77.71	98.01	91.07	104.11	86.40	
% RECOVERY, PULV AVG		%			91.75				
SAMPLE IDENTIFICATION									
SIEVE ANALYSIS		COMPANY	IPSC	B&W					
% PASSING 50 MESH		%	99.6	99.98					
% PASSING 70 MESH		%		99.78					
% PASSING 100 MESH		%	97.2	97.98					
% PASSING 140 MESH		%		89.72					
% PASSING 200 MESH		%	74.8	76.04					
PULVERIZED COAL SURFACE MOISTURE		%							
RAW COAL TOTAL MOISTURE		%	7.71						
RAW COAL SURFACE MOISTURE		%	6.4						
RAW COAL GRINDABILITY		HGI	43.8						

IP7_038745

BABCOCK & WILCOX

Figure 2-5

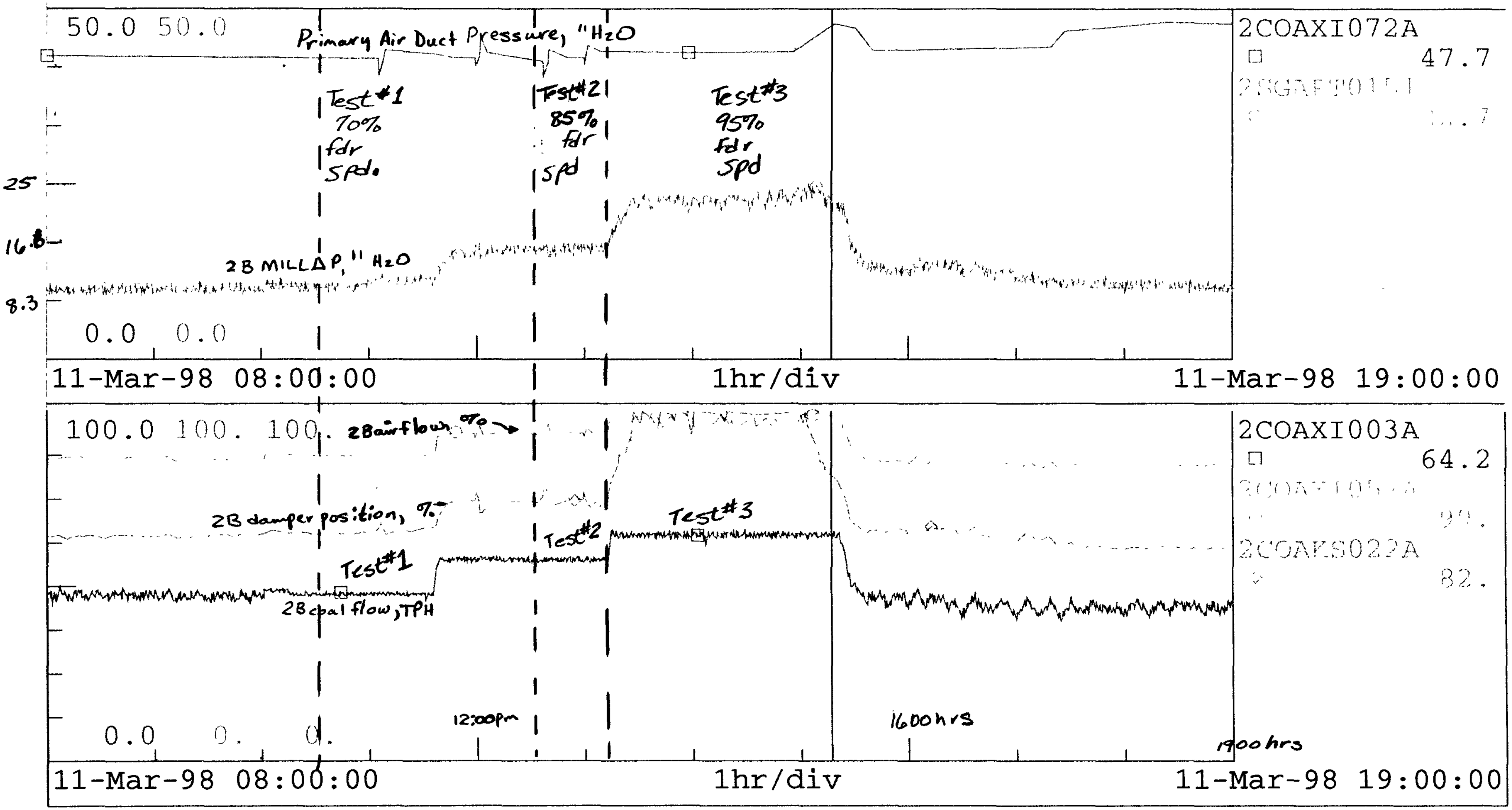


PLOT OF ROSIN AND RAMMLER EQUATION FOR USE WITH PULVERIZED COAL

CUSTOMER Intermountain Power	JOB NO. ~~RB~~-615
SUBJECT MILL 2B @ 95% on "good" coal	
	BY NSMoen
	DATE 3/18/98

Mill 2B Performance w/ [illegible]w Rock/Fuel Ratio

Printed out for: PHONG-D - 12-Mar-98 19:01:33
100 Messages PULV PERF PULVERIZER PERFORMANCE 12-Mar-98 19:01:33



EndTim= 11-Mar-98 19:00:00 /EvalTim= 11-Mar-98 15:17:10 /PanRate= 0

Figure 2-6

IP7_038747

Unit 2 Pulv	Test 1 B	Test 2 B	Test 3 B	
% Feeder Speed	70.3	84.7	95.0	2SGAPEFDRB
Actual Pulv Coal Flow (tph)	47.8	57.6	64.6	2COAXI003A
PA Damper Position (%)	65.5	74.1	99.0	2COAKS022A
PA Flow (%)	87.4	93.7	96.9	2COAXI057A
PA Inlet Damper Temp (DEGF)	304.8	337.2	337.2	2SGATE0640
Pulv PA air temp comp (Deg F)	310.2	339.0	351.4	2COAXI201A
PA D/P (INWC)	10.6	15.4	22.5	2SGAPT0151
Disch Temp (DEGF)	148.4	148.8	148.4	2COAXI065A
Pulv Motor (amps)	67.8	70.3	71.7	2SGAKK0002
Pulv B amp swing	8.7	8.8	11.2	2SGAPE1002
PULV 1B, 30K OVRHAUL HOURS	8319	8321	8322	2SGATZ006C
Pulv Pitot Tube DP (INWC)	3.76	4.03	4.17	2SGBPE0057
PA Mass Flowrate (lb/min)	3743	3797	3859	2SGBPX1090
Pulv Temp air flow	1939	1720	1761	2SGBPX4060
Pulv Air Bias	0.0	0.0	0.0	2COAXI212A
Pulv Coal Bias	0.0	0.0	0.0	2COAXI222A
Barometric Pressure (inhg)	25.55	25.54	25.53	2INAPT0227
Pri Air Duct Pressure (inwc)	43.14	43.16	43.77	2COAXI072A

	Start time	End Time
Test 1	3/11/98 10:10	3/11/98 11:30
Test 2	3/11/98 11:45	3/11/98 13:00
Test 3	3/11/98 13:40	3/11/98 14:30

"good" coal

Figure 2-7

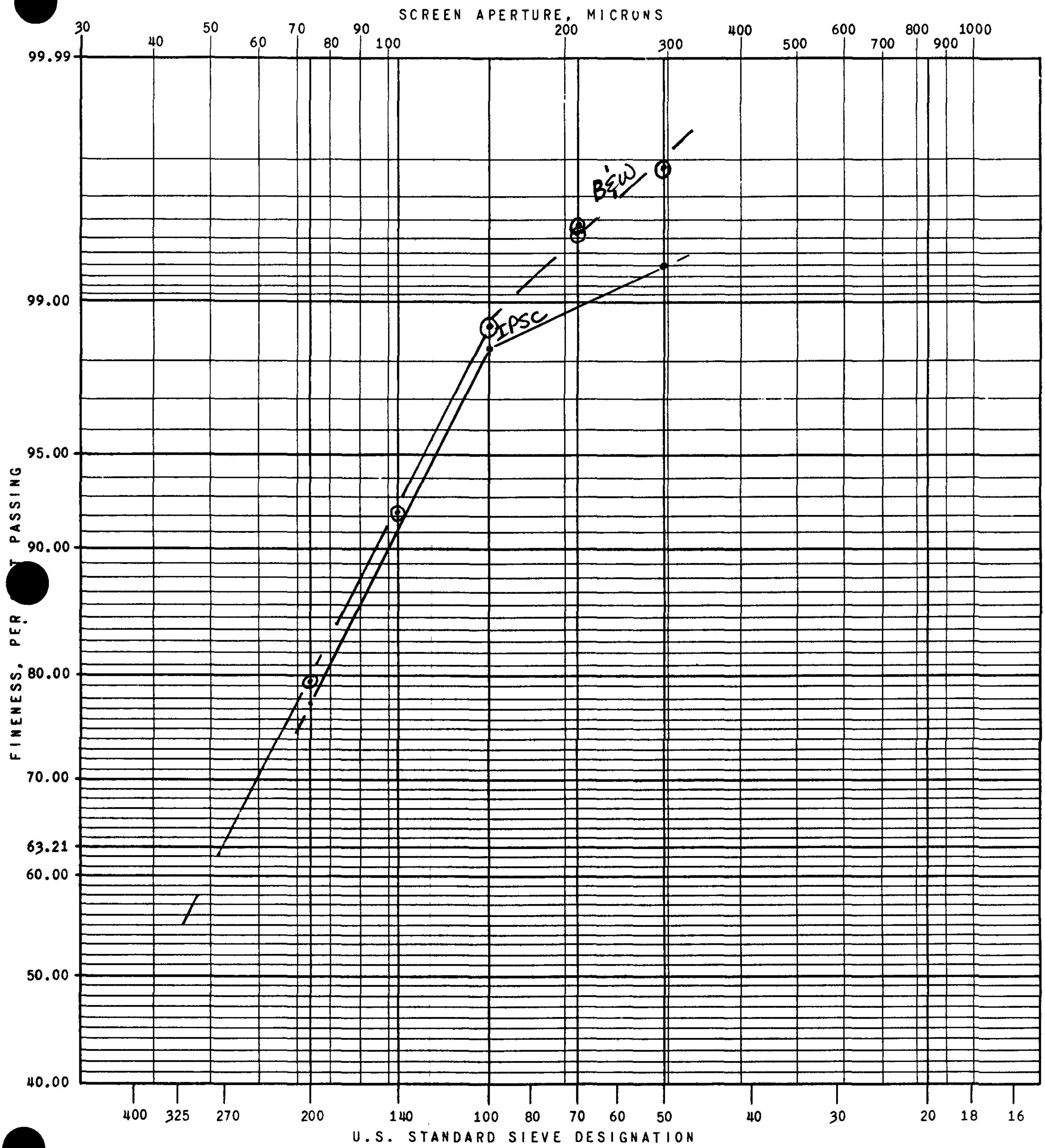
CUSTOMER:	LOCATION	IPP							
PLANT:		Intermountain							
CONTRACT NO.:		RB-614		(FILE ID:2HWLDIPP.WK4)					
PERFORMED BY:		GN KIRK, DR DOUGAN, NS MOEN							
TEST NUMBER			1		1		TEST		
DATE		MO/DAY/YR	3/11/98		3/11/98		AVERAGE		
TIME		HOURS	1545		1615				
PULVERIZER NUMBER:		#	2H		2H				
BAROMETRIC PRESSURE	CONTROL ROOM	IN Hg	25.52		25.52		25.52		
COAL FLOW (CONTROL ROOM)	CR	%	70.00		70.00		70.00		
COAL FLOW (CONTROL ROOM)	CR	LB/HR	96000		96000		96000		
PRIMARY AIR BIAS	CR	%	0.0		0.0		0.0		
PRIMARY AIR FLOW	CR	%	88.00		88.00		88.00		
PRIMARY AIR DIFF.	CR	IN WG	3.85		3.85		3.85		
PRIMARY AIR DIFF.	MANOMETER	IN WG	3.40		3.38		3.39		
MILL DIFF (K61-K62)	CR	IN WG	14.00		14.00		14.00		
MILL DIFF (K61-K62)	MANOMETER	IN WG	13.0		13.0		13.00		
LOSIDE MILL DIFF STATIC	(K62 MAN)	IN WG	11.8		11.8		11.8		
PRIMARY AIR PLENUM PRESSURE	CR	IN WG	43.6		43.6		43.6		
WINDBOX SIDE STATIC (K60L)	MANOMETER	IN WG	26.7		26.7		26.7		
WINDBOX-LOSIDE DIFF(K60-K62)	CALCULATED	IN WG	14.9		14.9		14.9		
WINDBOX-LOSIDE DIFF(K60-K62)	MANOMETER	IN WG	15.0		15.0		15.0		
TURRET STATIC (TSP)	MANOMETER	IN WG	6.2		6.2		6.2		
CLASSIFIER DIFF (K62-TSP)	CALCULATED	IN WG	5.6		5.6		5.6		
CLASSIFIER DIFF (K62-TSP)	MANOMETER	IN WG	5.4		5.4		5.4		
MILL INLET AIR TEMP	CR	F	341		341		341		
MILL OUTLET AIR TEMP	CR	F	150		150		150		
AIR TEMP @ K60L	TC	F	316		316		316		
K FACTOR	#		9679		9679		9679		
CALC INLET AIR DENSITY (di)	CALCULATED	LB/FT3	0.04850		0.04850		0.04850		
CALC OUTLET AIR DENSITY (do)	CALCULATED	LB/FT3	0.05653		0.05657		0.05655		
CALC PRI AIR FLOW ENTRG MILL	CALCULATED	CFM	81044		80805		80924		
CALC PRI AIR MASS FLOW (IN CONTROLS)	CURVES	LB/HR	205200		205200		205200		
CALC PRI AIR MASS FLOW	CALCULATED	LB/HR	235816		235121		235468		
CALC PRI AIR FLOW LVG MILL	CALCULATED	CFM	69528		69266		69397		
PULVERIZER THROAT AREA	CALCULATED	FT^2	5.46		5.46		5.46		
PULVERIZER THROAT VELOCITY	CALCULATED	FPM	14843		14799		14821		
VERTICAL THROAT VELOCITY	CALCULATED	FPM	10494		10463		10479		
BURNER PIPE I.D.@TRAVERSE	MEASURED	INCHES	21.0		21.0		21.0		
CALC BURNER LINE AREA	CALCULATED	FT2	2.4053		2.4053		2.4053		
CALC AVERAGE BURNER LINE VELOCITY	CALCULATED	FPM	4818		4800		4809		
AIR/FUEL RATIO (AT INLETS)	CALCULATED	FT^3/LB	50.65		50.50		50.58		
AIR/FUEL RATIO (AT INLETS)	CALCULATED	LB/LB	2.46		2.45		2.45		
AIR/FUEL RATIO (AT OUTLET)	CALCULATED	FT^3/LB	43.46		43.29		43.37		
FUEL/AIR RATIO (AT INLET)	CALCULATED	LB/LB	0.41		0.41		0.41		
CLASSIFIER VANE LENGTH	MEASURED	IN		VANE LENGTH = 19 7/8"					
HYDRAULIC LOADING PRESSURE	MEASURED	PSIG	2100		2100		2100		
SPRING PRESSURE	CALCULATED	TONS/ROLL	24.5		24.5		24.5		
LOSIDE PITOT TUBE STATIC	MANOMETER	IN WG	38.5		38.5		38.5		
PYRITES REJECT RATE	HOPPER		1 ROCK EVERY 15 SEC, SOME 1/16" COAL						
MILL OPERATION	OBSERVED	SMOOTH/ROUGH	ROUGH ON TOP, RUMBLING BELOW						
PULV MOTOR CURRENT	CR	AMPS	64.0		66.0		65.0		
PULV MOTOR BUSS VOLTAGE	WATTMETER	VOLTS					6998		
AVG. MOTOR INPUT KVA	WATTMETER						840		
AVG. MOTOR INPUT POWER, KVAR	WATTMETER						596		
AVG. MOTOR INPUT POWER, KW (HP)	WATTMETER	KW (HP)					592.2(793.8)		
MOTOR POWER FACTOR	WATTMETER						0.71		
MILL INPUT POWER, KW (HP)	CALCULATED	KW (HP)					547.3(733.7)		
GRINDING ELEMENT AGE		7 MTHS		4291 HRS					
HA DAMPER POSITION	CR	%	44.0		44.0		44.0		
CA DAMPER POSITION	CR	%	56.0		56.0		56.0		
PA DAMPER POSITION	CR	%	73.4		73.4		73.4		
BURNER PIPE TRAVERSE NUMBER			1	2	3	4	5	6	
ORIFICE SIZE / ASPIRATING AIR PRESSURE	IN.W.C.		3	3	4	4.5	4.4		
SAMPLE WEIGHT		GRAMS	408.2	446.3	421.6	432.7	487.0	NO	
TIME SAMPLED								SAMPLING	
% RECOVERY, PIPE		%	96.00	105.00	99.00	102.00	115.00		
% RECOVERY, PULV AVG		%			103.40				
SAMPLE IDENTIFICATION									
SIEVE ANALYSIS		COMPANY	IPSC	B&W					
% PASSING 50 MESH		%	99.4	99.88					
% PASSING 70 MESH		%		99.68					
% PASSING 100 MESH		%	98.3	98.62					
% PASSING 140 MESH		%		92.10					
% PASSING 200 MESH		%	77.6	79.42					
PULVERIZED COAL SURFACE MOISTURE		%							
RAW COAL TOTAL MOISTURE		%	7.38						
RAW COAL SURFACE MOISTURE		%	5.95						
RAW COAL GRINDABILITY		HGI	49.1						

IP7_038749

BDS-1125

BABCOCK & WILCOX

Figure 2-9



PLOT OF ROSIN AND RAMMLER EQUATION FOR USE WITH PULVERIZED COAL

CUSTOMER Intermountain Power	**JOB NO.** RB-615
SUBJECT Mill 2H @ 70% fdr Spd on "good" coal	
	BY NSMoan
	DATE 3/19/98

IP7_038750

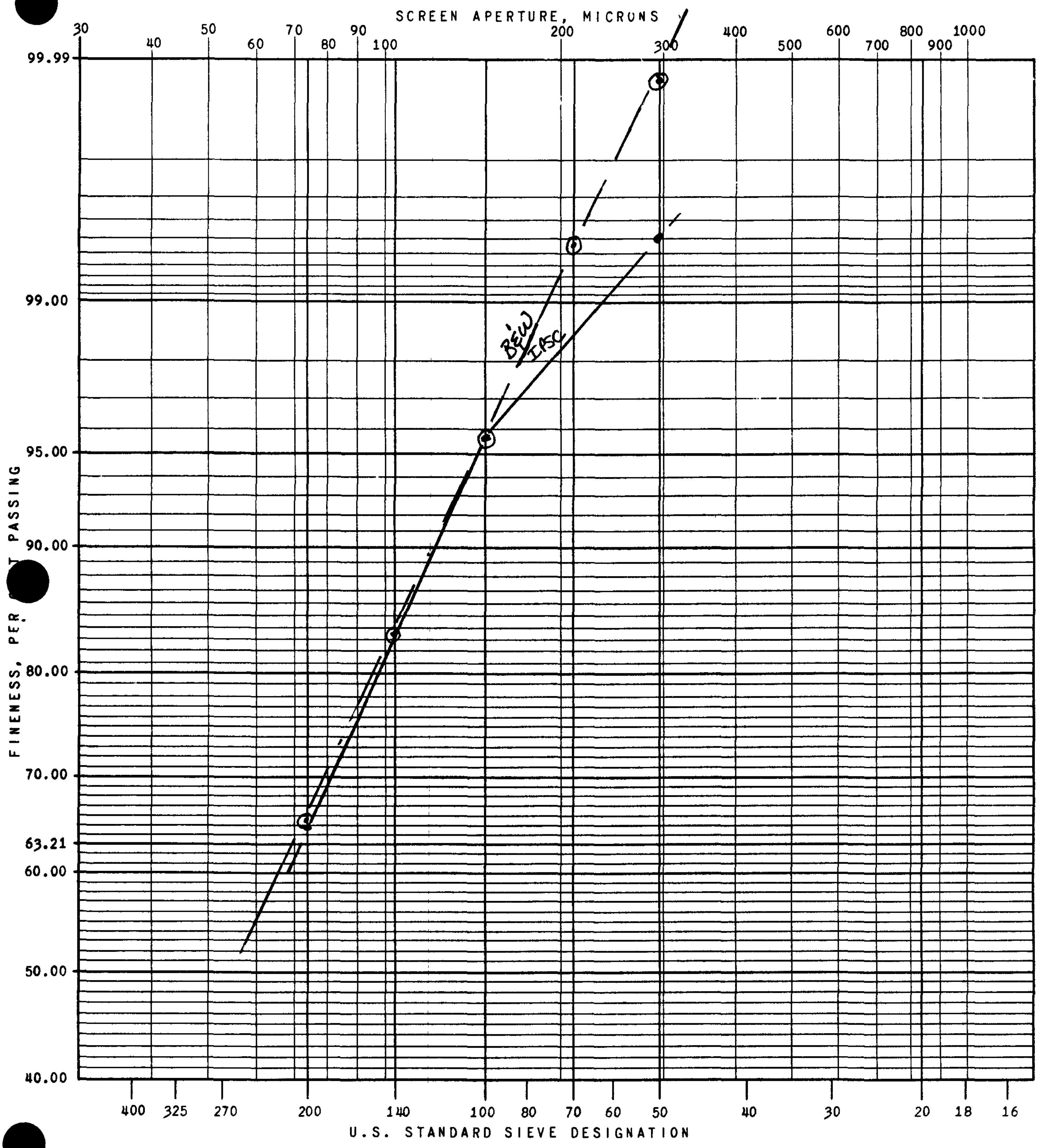
CUSTOMER:	LOCATION	IPP							
PLANT:		Intermountain							
CONTRACT NO.:		RB-614		(FILE ID:2HWLDIPP.WK4)					
PERFORMED BY:		GN KIRK, DR DOUGAN, NS MOEN							
TEST NUMBER			2		2		TEST		
DATE		MO/DAY/YR	3/11/98		3/11/98		AVERAGE		
TIME		HOURS	1645		1730				
PULVERIZER NUMBER:		#	2H		2H				
BAROMETRIC PRESSURE	CONTROL ROOM	IN Hg	25.52		25.52		25.52		
COAL FLOW (CONTROL ROOM)	CR	%	85.00		85.00		85.00		
COAL FLOW (CONTROL ROOM)	CR	LB/HR	116000		116000		116000		
PRIMARY AIR BIAS	CR	%	0.0		0.0		0.0		
PRIMARY AIR FLOW	CR	%	94.4		94.4				
PRIMARY AIR DIFF.	CR	IN WG	4.14		4.14		4.14		
PRIMARY AIR DIFF.	MANOMETER	IN WG	3.94		4.02		3.98		
MILL DIFF (K61-K62)	CR	IN WG	16.00		16.00		16.00		
MILL DIFF (K61-K62)	MANOMETER	IN WG	16.1		16.1		16.10		
LOSIDE MILL DIFF STATIC	(K62 MAN)	IN WG	14.7		14.7		14.7		
PRIMARY AIR PLENUM PRESSURE	CR	IN WG	43.8		43.8		43.8		
WINDBOX SIDE STATIC (K60L)	MANOMETER	IN WG	35.6		35.6		35.6		
WINDBOX-LOSIDE DIFF(K60-K62)	CALCULATED	IN WG	20.9		20.9		20.9		
WINDBOX-LOSIDE DIFF(K60-K62)	MANOMETER	IN WG	18.1		18.1		18.1		
TURRET STATIC (TSP)	MANOMETER	IN WG	7.9		7.9		7.9		
CLASSIFIER DIFF (K62-TSP)	CALCULATED	IN WG	6.8		6.8		6.8		
CLASSIFIER DIFF (K62-TSP)	MANOMETER	IN WG	6.3		6.3				
MILL INLET AIR TEMP	CR	F	353		353		353		
MILL OUTLET AIR TEMP	CR	F	151		151		151		
AIR TEMP @ K60L	TC	F	348		348		348		
K FACTOR	#		9679		9679		9679		
CALC INLET AIR DENSITY (di)	CALCULATED	LB/FT3	0.04645		0.04645		0.04645		
CALC OUTLET AIR DENSITY (do)	CALCULATED	LB/FT3	0.05671		0.05671		0.05671		
CALC PRI AIR FLOW ENTRG MILL	CALCULATED	CFM	89139		90039		89589		
CALC PRI AIR MASS FLOW (IN CONTROLS)	CURVES	LB/HR	221400		221400		221400		
CALC PRI AIR MASS FLOW	CALCULATED	LB/HR	248451		250961		249706		
CALC PRI AIR FLOW LVG MILL	CALCULATED	CFM	73022		73760		73391		
PULVERIZER THROAT AREA	CALCULATED	FT^2	5.46		5.46		5.46		
PULVERIZER THROAT VELOCITY	CALCULATED	FPM	16326		16491		16408		
VERTICAL THROAT VELOCITY	CALCULATED	FPM	11542		11659		11601		
BURNER PIPE I.D.@TRAVERSE	MEASURED	INCHES	21.0		21.0		21.0		
CALC BURNER LINE AREA	CALCULATED	FT2	2.4053		2.4053		2.4053		
CALC AVERAGE BURNER LINE VELOCITY	CALCULATED	FPM	5060		5111		5085		
AIR/FUEL RATIO (AT INLETS)	CALCULATED	FT^3/LB	46.11		46.57		46.34		
AIR/FUEL RATIO (AT INLETS)	CALCULATED	LB/LB	2.14		2.16		2.15		
AIR/FUEL RATIO (AT OUTLET)	CALCULATED	FT^3/LB	37.77		38.15		37.96		
FUEL/AIR RATIO (AT INLET)	CALCULATED	LB/LB	0.47		0.46		0.46		
CLASSIFIER VANE LENGTH	MEASURED	IN		VANE LENGTH = 19 7/8"					
HYDRAULIC LOADING PRESSURE	MEASURED	PSIG	2400		2400		2400		
SPRING PRESSURE	CALCULATED	TONS/ROLL	28		28		28		
LOSIDE PITOT TUBE STATIC	MANOMETER	IN WG	37.5		37.5		37.5		
PYRITES REJECT RATE	HOPPER		1 ROCK EVERY 15 SEC (NO COAL)						
MILL OPERATION	OBSERVED	SMOOTH/ROUGH	SMOOTH						
PULV MOTOR CURRENT	CR	AMPS	71.0		74.0		72.5		
PULV MOTOR BUSS VOLTAGE	WATTMETER	VOLTS					6993		
AVG. MOTOR INPUT KVA	WATTMETER						865		
AVG. MOTOR INPUT POWER, KVAR	WATTMETER						605		
AVG. MOTOR INPUT POWER, KW (HP)	WATTMETER	KW (HP)					618.2(828.7)		
MOTOR POWER FACTOR	WATTMETER						0.71		
MILL INPUT POWER, KW (HP)	CALCULATED	KW (HP)					573(768.1)		
GRINDING ELEMENT AGE		7 MTHS		4292 HRS					
HA DAMPER POSITION	CR	%							
CA DAMPER POSITION	CR	%							
PA DAMPER POSITION	CR	%	81.3		81.3		81.3		
BURNER PIPE TRAVERSE NUMBER			A	B	C	D	E	F	
ORIFICE SIZE / ASPIRATING AIR PRESSURE									
SAMPLE WEIGHT		GRAMS							
TIME SAMPLED									
% RECOVERY, PIPE		%							
% RECOVERY, PULV AVG		%							
SAMPLE IDENTIFICATION			B&W#1						
SIEVE ANALYSIS		COMPANY	B&W						
% PASSING 50 MESH		%			NO				
% PASSING 70 MESH		%							
% PASSING 100 MESH		%							
% PASSING 140 MESH		%			SAMPLING				
% PASSING 200 MESH		%							
PULVERIZED COAL SURFACE MOISTURE		%							
RAW COAL TOTAL MOISTURE		%							
RAW COAL SURFACE MOISTURE		%							
RAW COAL GRINDABILITY		HGI							

CUSTOMER:	LOCATION	IPP							
PLANT:		Intermountain							
CONTRACT NO.:		RB-614		(FILE ID:2HWLDIPP.WK4)					
PERFORMED BY:		GN KIRK, DR DOUGAN, NS MOEN							
TEST NUMBER			3		3		TEST		
DATE		MO/DAY/YR	3/11/98		3/11/98		AVERAGE		
TIME		HOURS	1745		1830				
PULVERIZER NUMBER:		#	2H		2H				
BAROMETRIC PRESSURE	CONTROL ROOM	IN Hg	25.49		25.49		25.49		
COAL FLOW (CONTROL ROOM)	CR	%	95.00		95.00		95.00		
COAL FLOW (CONTROL ROOM)	CR	LB/HR	130000		130000		130000		
PRIMARY AIR BIAS	CR	%	0.0		0.0		0.0		
PRIMARY AIR FLOW	CR	%	99.0		98.0		99		
PRIMARY AIR DIFF.	CR	IN WG	4.34		4.34		4.34		
PRIMARY AIR DIFF.	MANOMETER	IN WG	4.51		4.51		4.51		
MILL DIFF (K61-K62)	CR	IN WG	22.90		22.90		22.90		
MILL DIFF (K61-K62)	MANOMETER	IN WG	23.1		23.1		23.10		
LOSIDE MILL DIFF STATIC	(K62 MAN)	IN WG	16.8		16.8		16.8		
PRIMARY AIR PLENUM PRESSURE	CR	IN WG	47.7		47.7		47.7		
WINDBOX SIDE STATIC (K60L)	MANOMETER	IN WG	40.8		40.8		40.8		
WINDBOX-LOSIDE DIFF(K60-K62)	CALCULATED	IN WG	24.0		24.0		24.0		
WINDBOX-LOSIDE DIFF(K60-K62)	MANOMETER	IN WG	24.0		24.0		24.0		
TURRET STATIC (TSP)	MANOMETER	IN WG	9.8		9.8		9.8		
CLASSIFIER DIFF (K62-TSP)	CALCULATED	IN WG	7.0		7.0		7.0		
CLASSIFIER DIFF (K62-TSP)	MANOMETER	IN WG	7.1		7.1				
MILL INLET AIR TEMP	CR	F	376		376		376		
MILL OUTLET AIR TEMP	CR	F	148		148		148		
AIR TEMP @ K60L	TC	F	364		364		364		
K FACTOR	#		9679		9679		9679		
CALC INLET AIR DENSITY (di)	CALCULATED	LB/FT3	0.04586		0.04586		0.04586		
CALC OUTLET AIR DENSITY (do)	CALCULATED	LB/FT3	0.05723		0.05723		0.05723		
CALC PRI AIR FLOW ENTRG MILL	CALCULATED	CFM	95986		95986		95986		
CALC PRI AIR MASS FLOW (IN CONTROLS)	CURVES	LB/HR	234000		234000		234000		
CALC PRI AIR MASS FLOW	CALCULATED	LB/HR	264108		264108		264108		
CALC PRI AIR FLOW LVG MILL	CALCULATED	CFM	76919		76919		76919		
PULVERIZER THROAT AREA	CALCULATED	FT^2	5.46		5.46		5.46		
PULVERIZER THROAT VELOCITY	CALCULATED	FPM	17580		17580		17580		
VERTICAL THROAT VELOCITY	CALCULATED	FPM	12429		12429		12429		
BURNER PIPE I.D.@TRAVERSE	MEASURED	INCHES	21.0		21.0		21.0		
CALC BURNER LINE AREA	CALCULATED	FT2	2.4053		2.4053		2.4053		
CALC AVERAGE BURNER LINE VELOCITY	CALCULATED	FPM	5330		5330		5330		
AIR/FUEL RATIO (AT INLETS)	CALCULATED	FT^3/LB	44.30		44.30		44.30		
AIR/FUEL RATIO (AT INLETS)	CALCULATED	LB/LB	2.03		2.03		2.03		
AIR/FUEL RATIO (AT OUTLET)	CALCULATED	FT^3/LB	35.50		35.50		35.50		
FUEL/AIR RATIO (AT INLET)	CALCULATED	LB/LB	0.49		0.49		0.49		
CLASSIFIER VANE LENGTH	MEASURED	IN		VANE LENGTH = 19 7/8"					
HYDRAULIC LOADING PRESSURE	MEASURED	PSIG	2400		2400		2400		
SPRING PRESSURE	CALCULATED	TONS/ROLL	28		28		28		
LOSIDE PITOT TUBE STATIC	MANOMETER	IN WG	40.5		40.5		40.5		
PYRITES REJECT RATE	HOPPER		SOME ROCK, 1 PC 1/16" COAL/30 SEC						
MILL OPERATION	OBSERVED	SMOOTH/ROUGH	SMOOTH						
PULV MOTOR CURRENT	CR	AMPS	68.0		72.0		70.0		
PULV MOTOR BUSS VOLTAGE	WATTMETER	VOLTS					6984		
AVG. MOTOR INPUT KVA	WATTMETER						847		
AVG. MOTOR INPUT POWER, KVAR	WATTMETER						594		
AVG. MOTOR INPUT POWER, KW (HP)	WATTMETER	KW (HP)					603.5(808.9)		
MOTOR POWER FACTOR	WATTMETER						0.71		
MILL INPUT POWER, KW (HP)	CALCULATED	KW (HP)					559.1(749.5)		
GRINDING ELEMENT AGE		7 MTHS		4293 HRS					
HA DAMPER POSITION	CR	%							
CA DAMPER POSITION	CR	%							
PA DAMPER POSITION	CR	%	93.2		93.2		93.2		
BURNER PIPE TRAVERSE NUMBER			1	2	3	4	5	6	
ORIFICE SIZE / ASPIRATING AIR PRESSURE			3"	3.8"	4"	4"	3.5"		
SAMPLE WEIGHT		GRAMS	563.8	642.7	579.1	644.8	547.5		
TIME SAMPLED					595.58				
% RECOVERY, PIPE		%	97.00	111.00	100.00	111.00	94.00		
% RECOVERY, PULV AVG		%			102.60				
SAMPLE IDENTIFICATION									
SIEVE ANALYSIS		COMPANY	IPSC	B&W					
% PASSING 50 MESH		%	99.6	99.98					
% PASSING 70 MESH		%		99.58					
% PASSING 100 MESH		%	95.7	95.80					
% PASSING 140 MESH		%		83.32					
% PASSING 200 MESH		%	64.8	66.52					
PULVERIZED COAL SURFACE MOISTURE		%							
RAW COAL TOTAL MOISTURE		%	7.38						
RAW COAL SURFACE MOISTURE		%	6.07						
RAW COAL GRINDABILITY		HGI	46.2						

IP7_038752

BABCOCK & WILCOX

Figure 2-12



PLOT OF ROSIN AND RAMMLER EQUATION FOR USE WITH PULVERIZED COAL

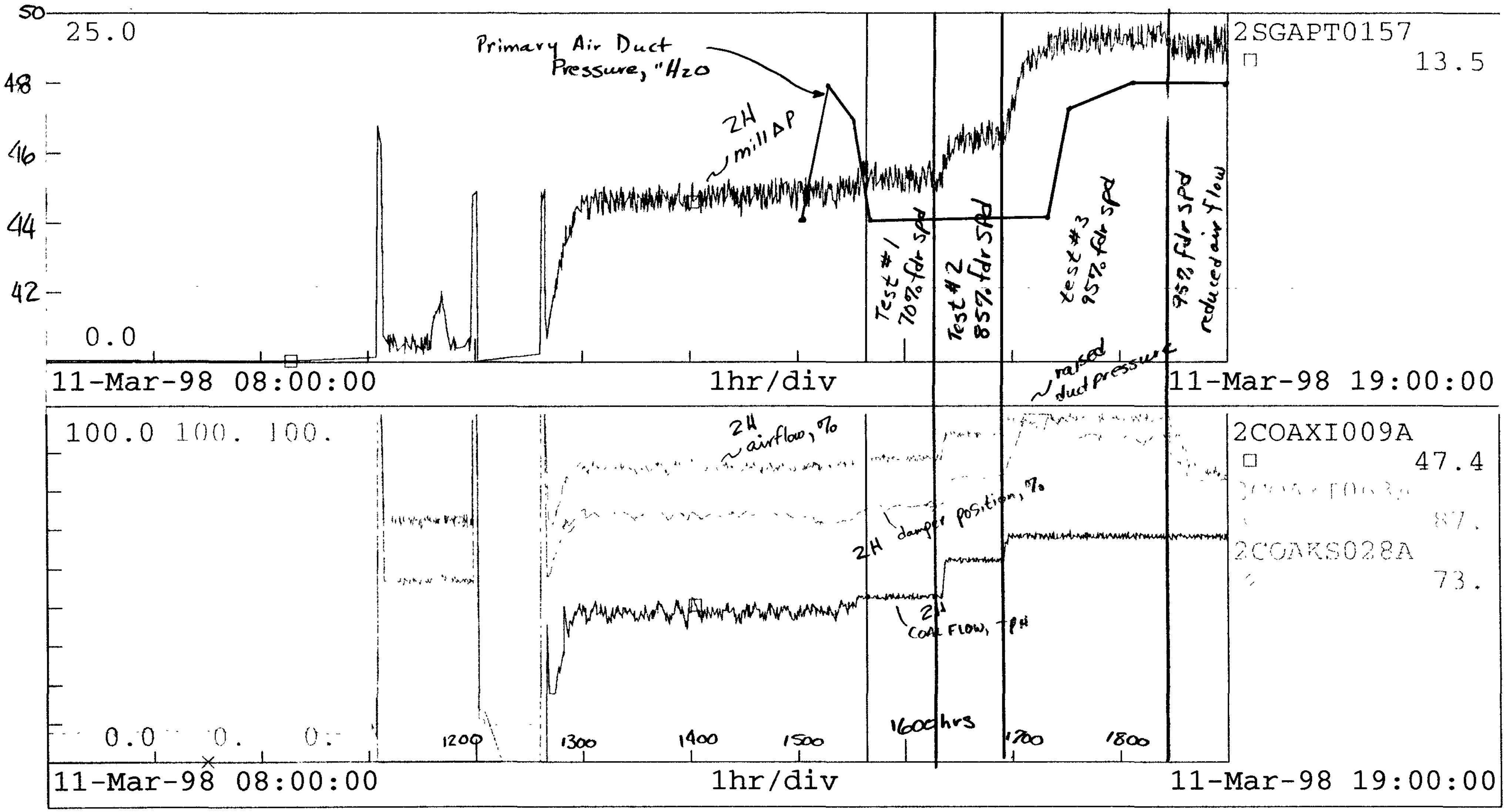
CUSTOMER Intermountain Power	JOB NO. RB-615
SUBJECT MILL 2H @ 95% on "good" coal	
	BY NSMoen
	DATE 3/18/98

STOMER:	LOCATION	IPP							
PLANT:		Intermountain							
CONTRACT NO.:		RB-614		(FILE ID:2HWLDIPP.WK4)					
PERFORMED BY:		GN KIRK, DR DOUGAN, NS MOEN							
TEST NUMBER			RAF		RAF		TEST		
DATE		MO/DAY/YR	3/11/98		3/11/98		AVERAGE		
TIME		HOURS	1900		1930				
PULVERIZER NUMBER:		#	2H		2H				
BAROMETRIC PRESSURE	CONTROL ROOM	IN Hg	25.49		25.49		25.49		
COAL FLOW (CONTROL ROOM)	CR	%	95.00		95.00		95.00		
COAL FLOW (CONTROL ROOM)	CR	LB/HR	130000		130000		130000		
PRIMARY AIR BIAS	CR	%	0.0		0.0		0.0		
PRIMARY AIR FLOW	CR	%	83.0		83.0				
PRIMARY AIR DIFF.	CR	IN WG	N/A		N/A				
PRIMARY AIR DIFF.	MANOMETER	IN WG	3.34		3.34		3.34		
MILL DIFF (K61-K62)	CR	IN WG	22.90		22.90		22.90		
MILL DIFF (K61-K62)	MANOMETER	IN WG	23.2		23.2		23.20		
LOSIDE MILL DIFF STATIC	(K62 MAN)	IN WG	13.6		13.6		13.6		
PRIMARY AIR PLENUM PRESSURE	CR	IN WG	47.8		47.8		47.8		
WINDBOX SIDE STATIC (K60L)	MANOMETER	IN WG	37.6		37.6		37.6		
WINDBOX-LOSIDE DIFF(K60-K62)	CALCULATED	IN WG	24.0		24.0		24.0		
WINDBOX-LOSIDE DIFF(K60-K62)	MANOMETER	IN WG	24.4		24.4		24.4		
TURRET STATIC (TSP)	MANOMETER	IN WG	7.4		7.4		7.4		
CLASSIFIER DIFF (K62-TSP)	CALCULATED	IN WG	6.2		6.2		6.2		
CLASSIFIER DIFF (K62-TSP)	MANOMETER	IN WG	5.9		5.9				
MILL INLET AIR TEMP	CR	F	411		411		411		
MILL OUTLET AIR TEMP	CR	F	149		149		149		
AIR TEMP @ K60L	TC	F	390		390		390		
K FACTOR	#		9679		9679		9679		
CALC INLET AIR DENSITY (di)	CALCULATED	LB/FT3	0.04474		0.04474		0.04474		
CALC OUTLET AIR DENSITY (do)	CALCULATED	LB/FT3	0.05675		0.05675		0.05675		
CALC PRI AIR FLOW ENTRG MILL	CALCULATED	CFM	83626		83626		83626		
CALC PRI AIR MASS FLOW (IN CONTROLS)	CURVES	LB/HR	195000		195000		195000		
CALC PRI AIR MASS FLOW	CALCULATED	LB/HR	224500		224500		224500		
CALC PRI AIR FLOW LVG MILL	CALCULATED	CFM	65935		65935		65935		
PULVERIZER THROAT AREA	CALCULATED	FT^2	5.46		5.46		5.46		
PULVERIZER THROAT VELOCITY	CALCULATED	FPM	15316		15316		15316		
VERTICAL THROAT VELOCITY	CALCULATED	FPM	10829		10829		10829		
BURNER PIPE I.D.@TRAVERSE	MEASURED	INCHES	21.0		21.0		21.0		
CALC BURNER LINE AREA	CALCULATED	FT2	2.4053		2.4053		2.4053		
CALC AVERAGE BURNER LINE VELOCITY	CALCULATED	FPM	4569		4569		4569		
R/FUEL RATIO (AT INLETS)	CALCULATED	FT^3/LB	38.60		38.60		38.60		
R/FUEL RATIO (AT INLETS)	CALCULATED	LB/LB	1.73		1.73		1.73		
R/FUEL RATIO (AT OUTLET)	CALCULATED	FT^3/LB	30.43		30.43		30.43		
FUEL/AIR RATIO (AT INLET)	CALCULATED	LB/LB	0.58		0.58		0.58		
CLASSIFIER VANE LENGTH	MEASURED	IN		VANE LENGTH = 19 7/8"					
HYDRAULIC LOADING PRESSURE	MEASURED	PSIG	2400		2400		2400		
SPRING PRESSURE	CALCULATED	TONS/ROLL	28		28		28		
LOSIDE PITOT TUBE STATIC	MANOMETER	IN WG	43.0		43.0		43.0		
PYRITES REJECT RATE	HOPPER		ROCK AND SMALL SIZE/QTY COAL						
MILL OPERATION	OBSERVED	SMOOTH/ROUGH	SMOOTH						
PULV MOTOR CURRENT	CR	AMPS	77.5		77.5		77.5		
PULV MOTOR BUSS VOLTAGE	WATTMETER	VOLTS					6975		
AVG. MOTOR INPUT KVA	WATTMETER						899		
AVG. MOTOR INPUT POWER, KVAR	WATTMETER						613		
AVG. MOTOR INPUT POWER, KW (HP)	WATTMETER	KW (HP)					658(882)		
MOTOR POWER FACTOR	WATTMETER						0.71		
MILL INPUT POWER, KW (HP)	CALCULATED	KW (HP)					609.9(817.6)		
GRINDING ELEMENT AGE		7 MTHS		4293 HRS					
HA DAMPER POSITION	CR	%	56.0		56.0				
CA DAMPER POSITION	CR	%	44.0		44.0				
PA DAMPER POSITION	CR	%	80.9		80.9				
BURNER PIPE TRAVERSE NUMBER			A	B	C	D	E	F	
ORIFICE SIZE / ASPIRATING AIR PRESSURE									
SAMPLE WEIGHT		GRAMS							
TIME SAMPLED									
% RECOVERY, PIPE		%							
% RECOVERY, PULV AVG		%							
SAMPLE IDENTIFICATION			B&W#1						
SIEVE ANALYSIS		COMPANY	B&W						
% PASSING 50 MESH		%							
% PASSING 70 MESH		%							
% PASSING 100 MESH		%							
% PASSING 140 MESH		%							
% PASSING 200 MESH		%							
PULVERIZED COAL SURFACE MOISTURE		%							
RAW COAL TOTAL MOISTURE		%							
RAW COAL SURFACE MOISTURE		%							
RAW COAL GRINDABILITY		HGI							

IP7_038754

Primary Air Duct Pressure "H_2O

Printed out for: PHONG-D - 12-Mar-98 18:38:37
100 Messages PULV PERF PULVERIZER PERFORMANCE 12-Mar-98 18:38:37



EndTim= 11-Mar-98 19:00:00 /EvalTim= 11-Mar-98 15:38:31 /PanRate= 0

Figure 2-14

IP7_038755

Printed out for: GARRY-C - 11-May-98 14:38:12
100 Messages GC-TEST2 TEST 11-May-98 14:38:12

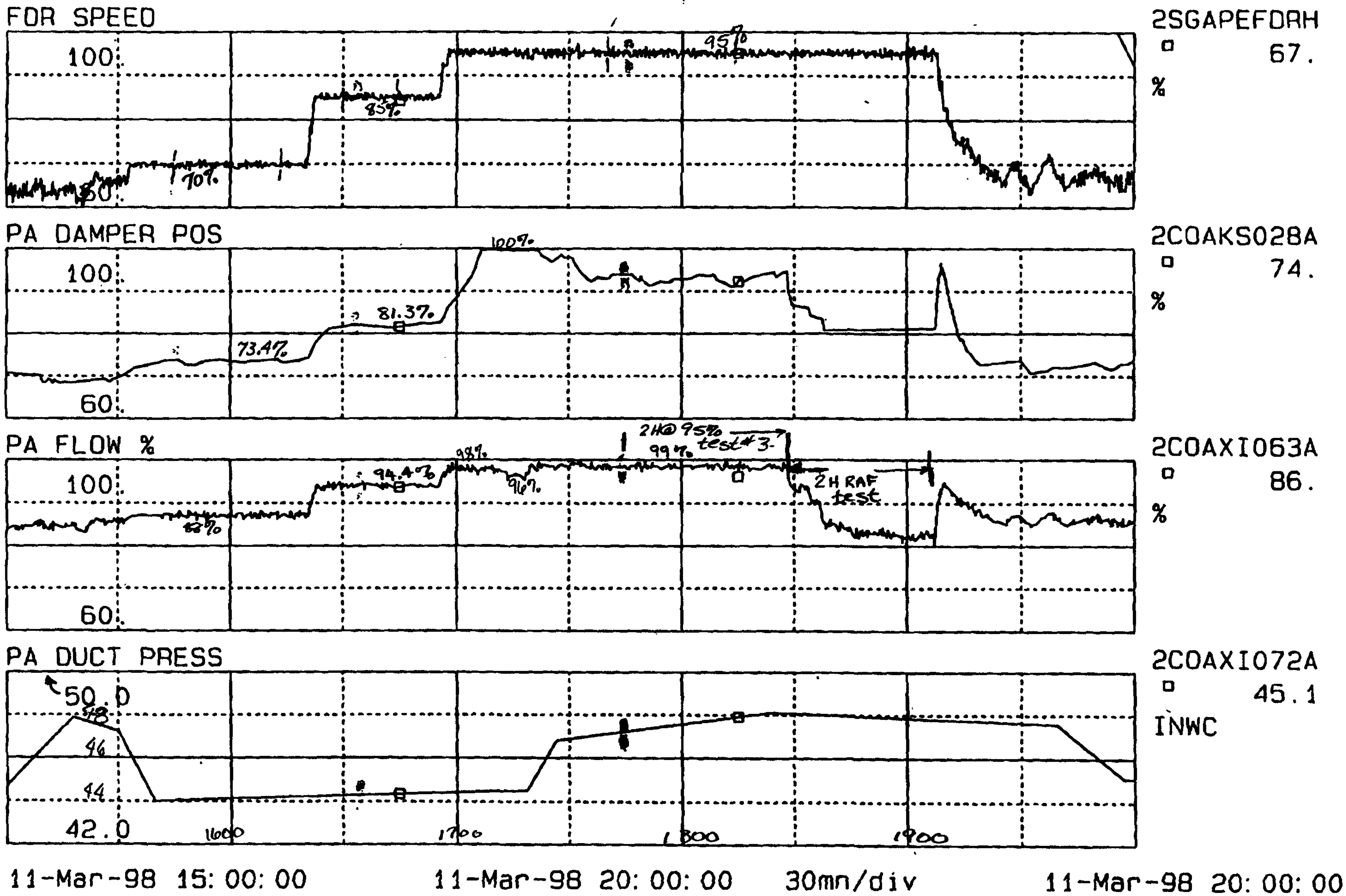


Figure 2-15

PAGE.002

	Test 1	Test 2	Test 3	
Unit 2 Pulv	H	H	H	
% Feeder Speed	69.7	85.1	95.2	2SGAPEFDRH
Actual Pulv Coal Flow (tph)	47.4	57.9	64.7	2COAXI009A
PA Damper Position (%)	73.4	81.7	92.8	2COAKS028A
PA Flow (%)	87.1	94.0	98.5	2COAXI063A
PA Inlet Damper Temp (DEGF)	330.8	358.6	375.8	2SGATE0646
Pulv PA air temp comp (Deg F)	337.0	364.1	377.3	2COAXI207A
PA D/P (INWC)	13.1	15.8	23.1	2SGAPT0157
Disch Temp (DEGF)	149.9	150.0	149.8	2COAXI071A
Pulv Motor (amps)	69.9	72.4	70.5	2SGAKK0008
Pulv H amp swing	11.3	13.5	7.5	2SGAPE1008
PULV 1H, 30K OVRHAUL HOURS	4291	4292	4293	2SGATZ012C
Pulv Pitot Tube DP (INWC)	3.85	4.14	4.34	2SGBPE0063
PA Mass Flowrate (lb/min)	3676	3749	3801	2SGBPX1096
Pulv Temp air flow	1709	1528	1419	2SGBPX4084
Pulv Air Bias	0.0	0.0	0.0	2COAXI218A
Pulv Coal Bias	0.0	0.0	0.0	2COAXI228A
Barometric Pressure (inhg)	25.52	25.52	25.52	2INAPT0227
Pri Air Duct Pressure (inwc)	44.12	44.30	47.51	2COAXI072A

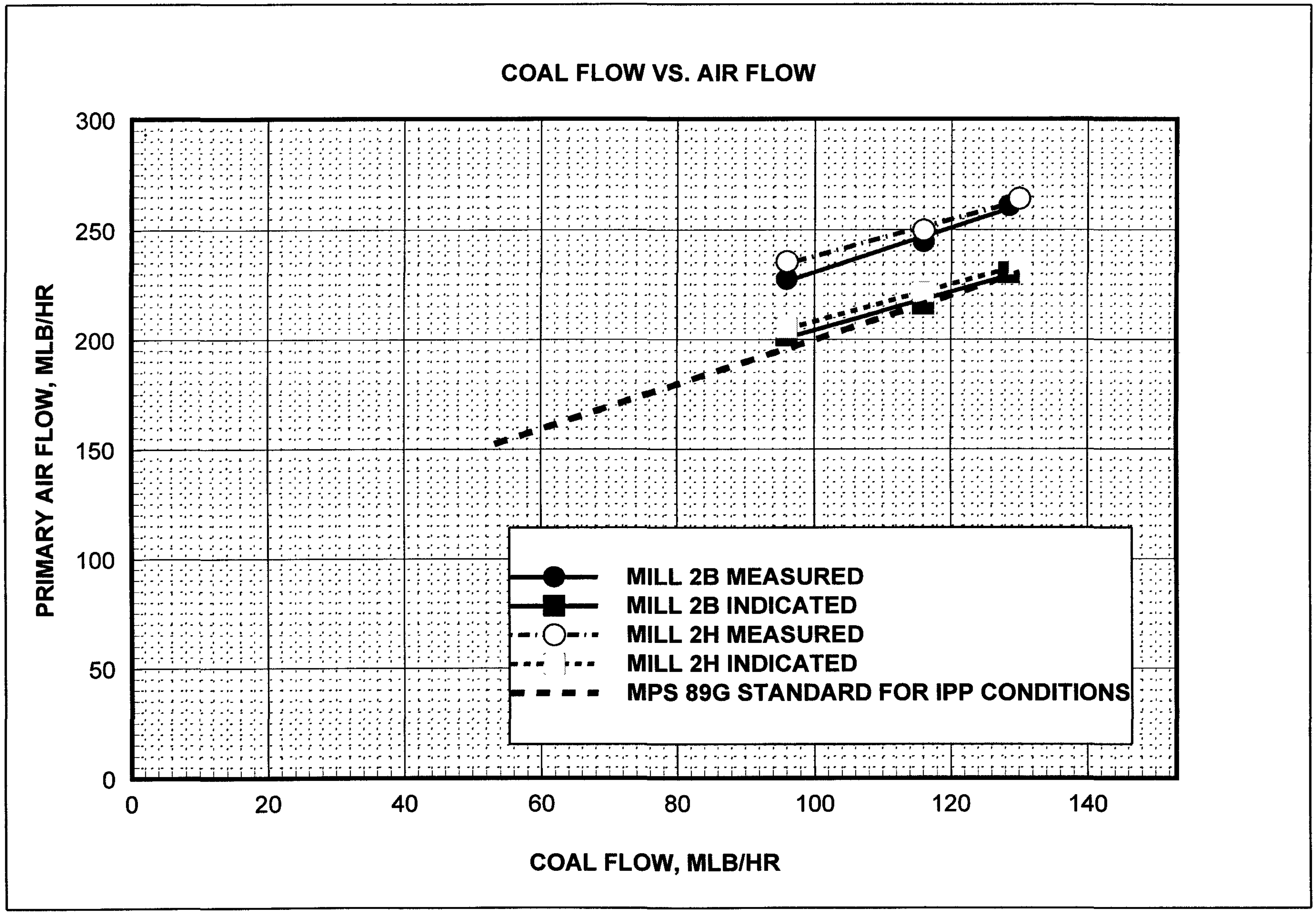
	Start time	End Time
Test 1	3/11/98 15:45	3/11/98 16:15
Test 2	3/11/98 16:30	3/11/98 16:45
Test 3	3/11/98 17:40	3/11/98 18:15

IP7_038757

Figure 2-15

FIGURE 2-17

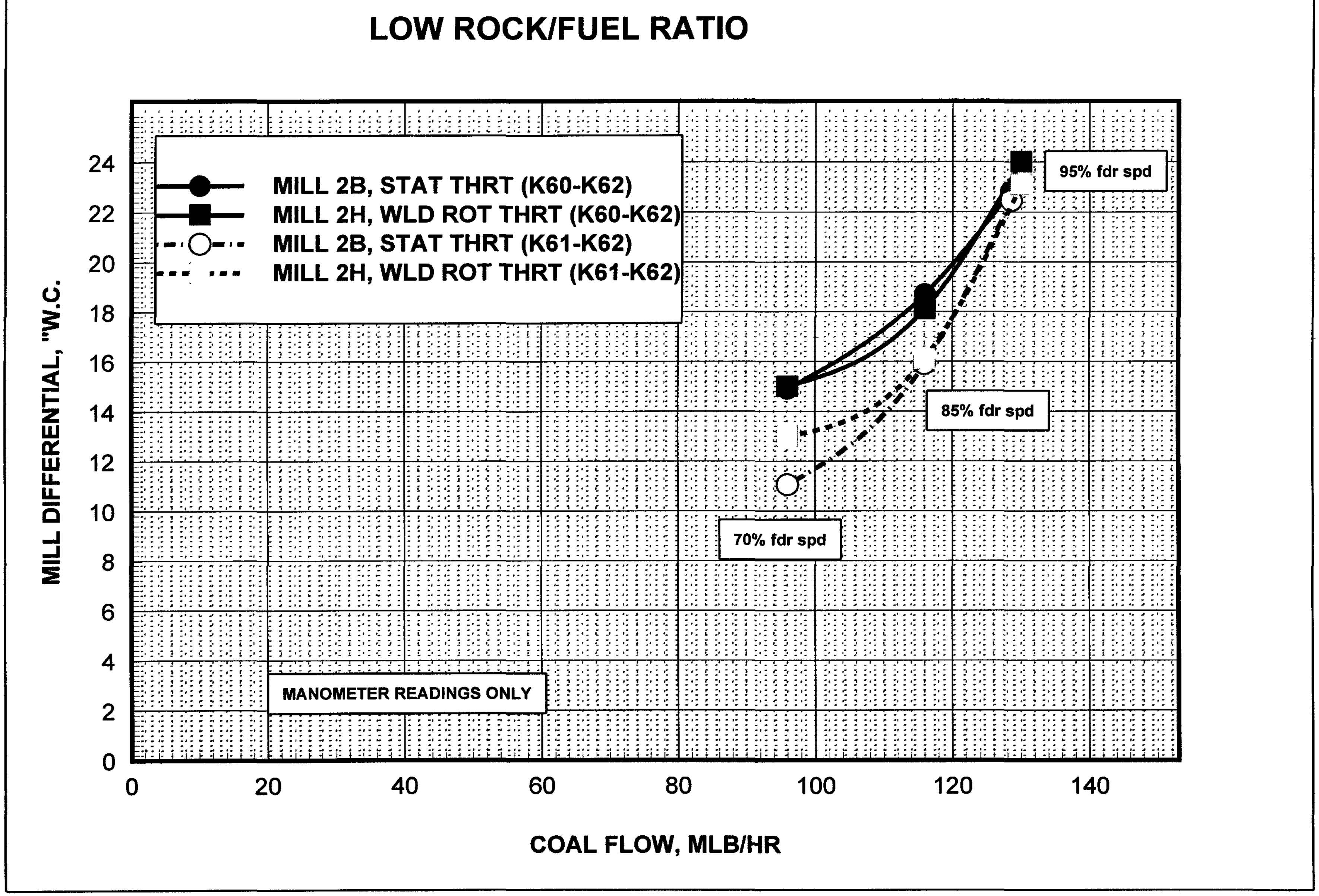
INTERMOUNTAIN POWER



CFVSAIRF May 18, 1998 3:29:47 PM

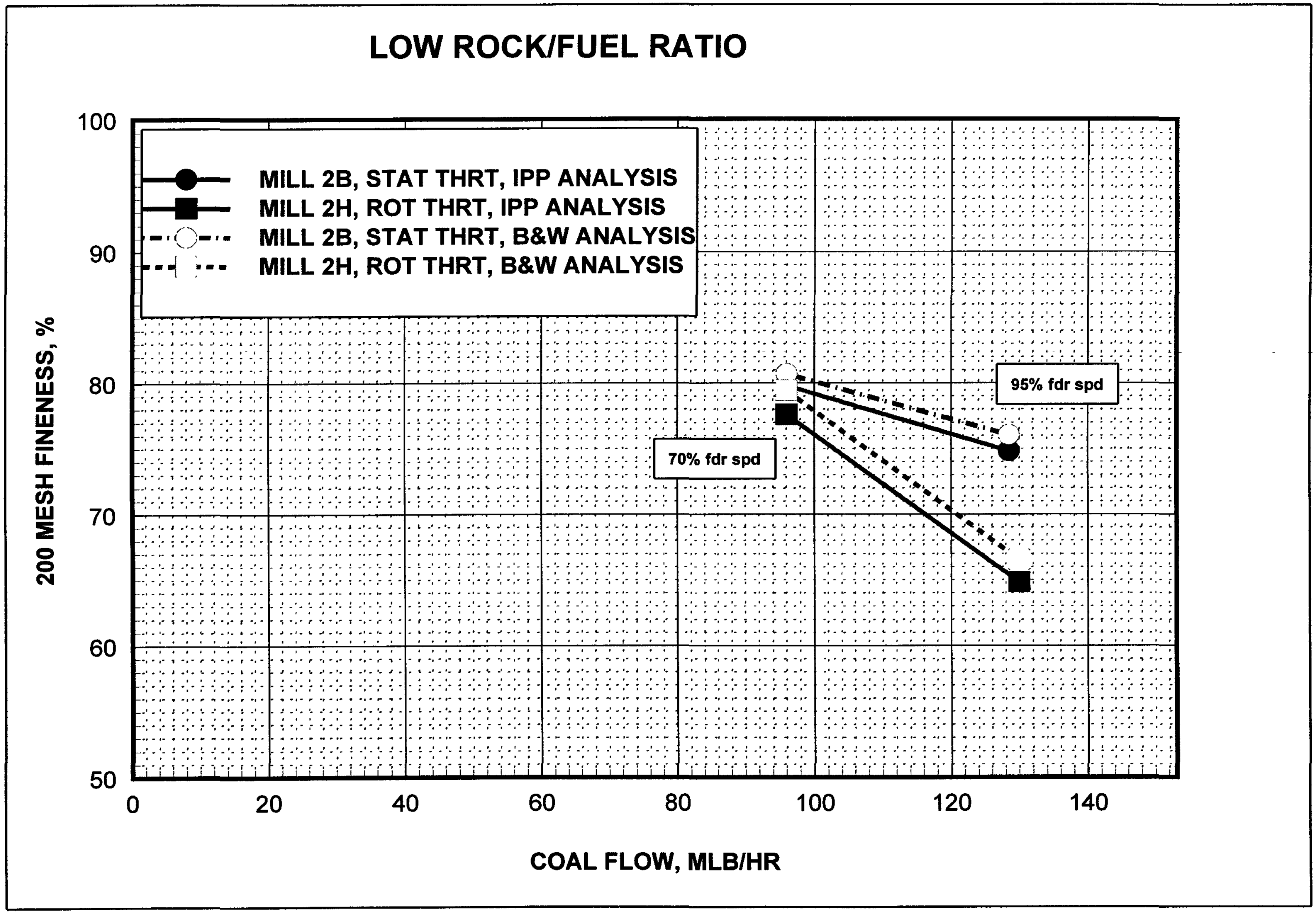
FIGURE 2-18

COAL FLOW VS. MILL DIFFERENTIAL



CFVSMLDP May 18, 1998 3:43:04 PM

COAL FLOW VS. 200 MESH FINENESS

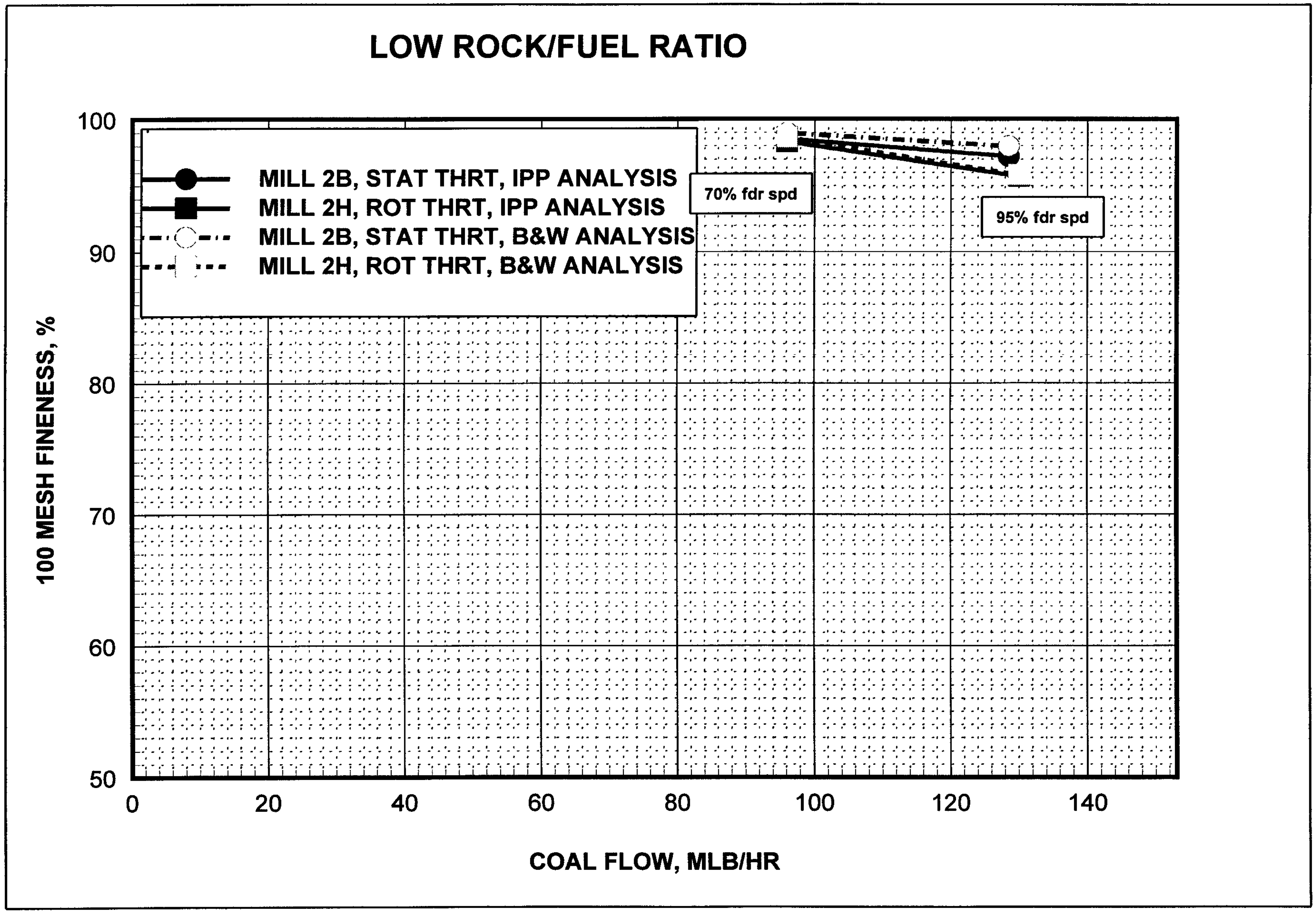


IP7_038760

FIGURE 2-19

CFVS200 June 3, 1998 11:40:22 AM

COAL FLOW VS. 100 MESH FINENESS



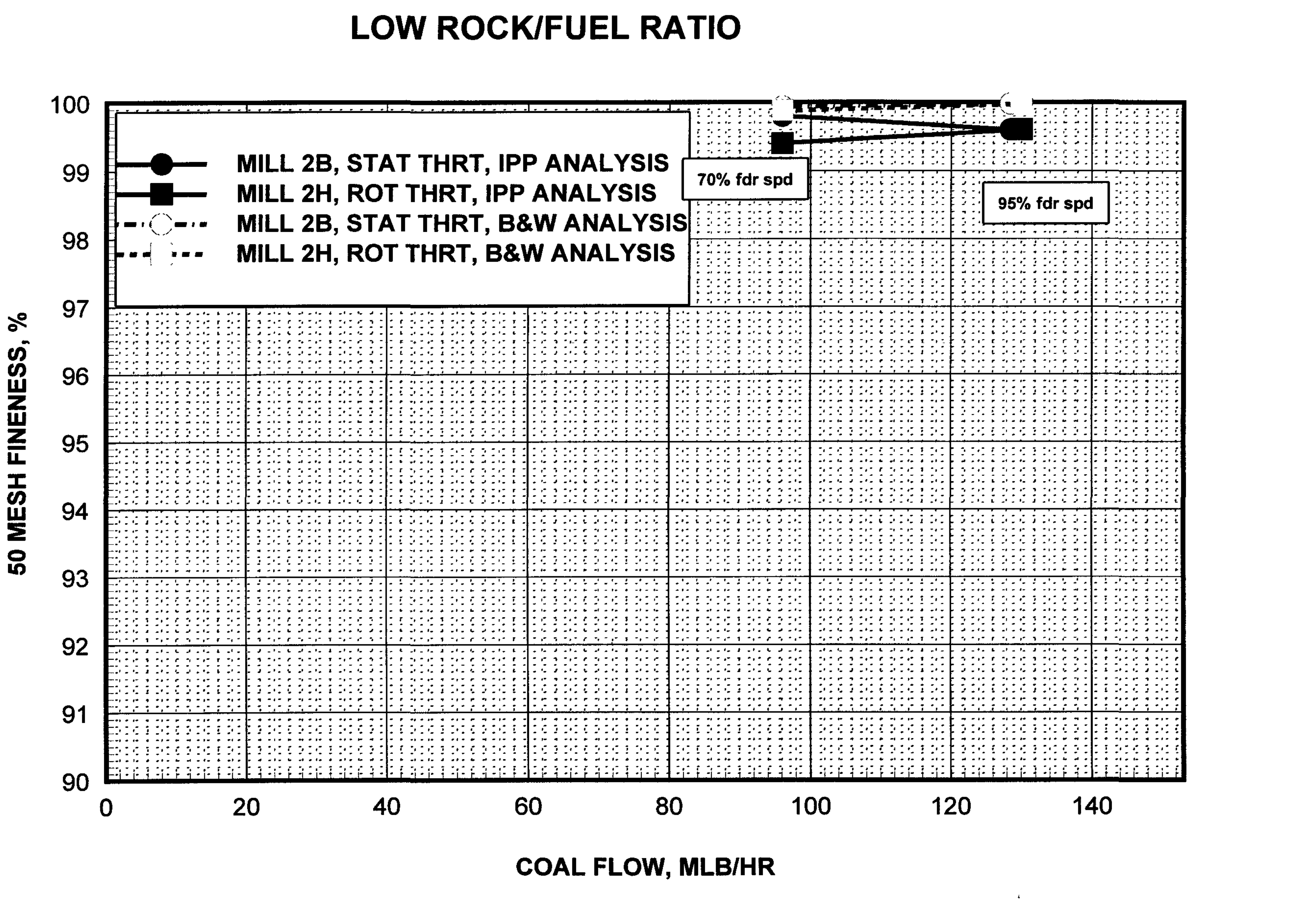
CFVS100 June 3, 1998 11:44:50 AM

FIGURE 2-20

IP7_038761

FIGURE 2-21

COAL FLOW VS. 50 MESH FINENESS



CFVS50 June 3, 1998 1:18:18 PM

INTERMOUNTAIN POWER
MILL MOTOR INFO

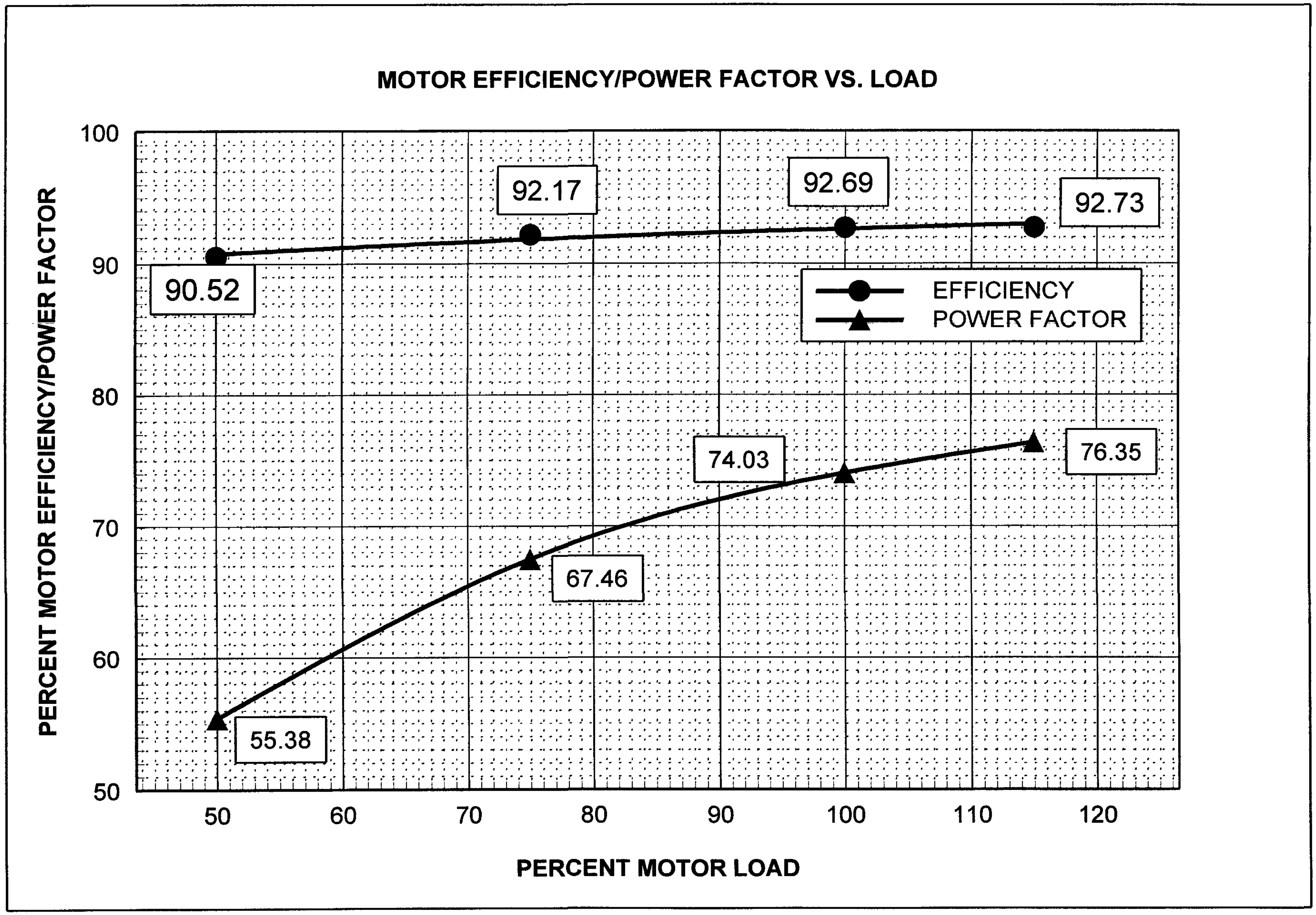
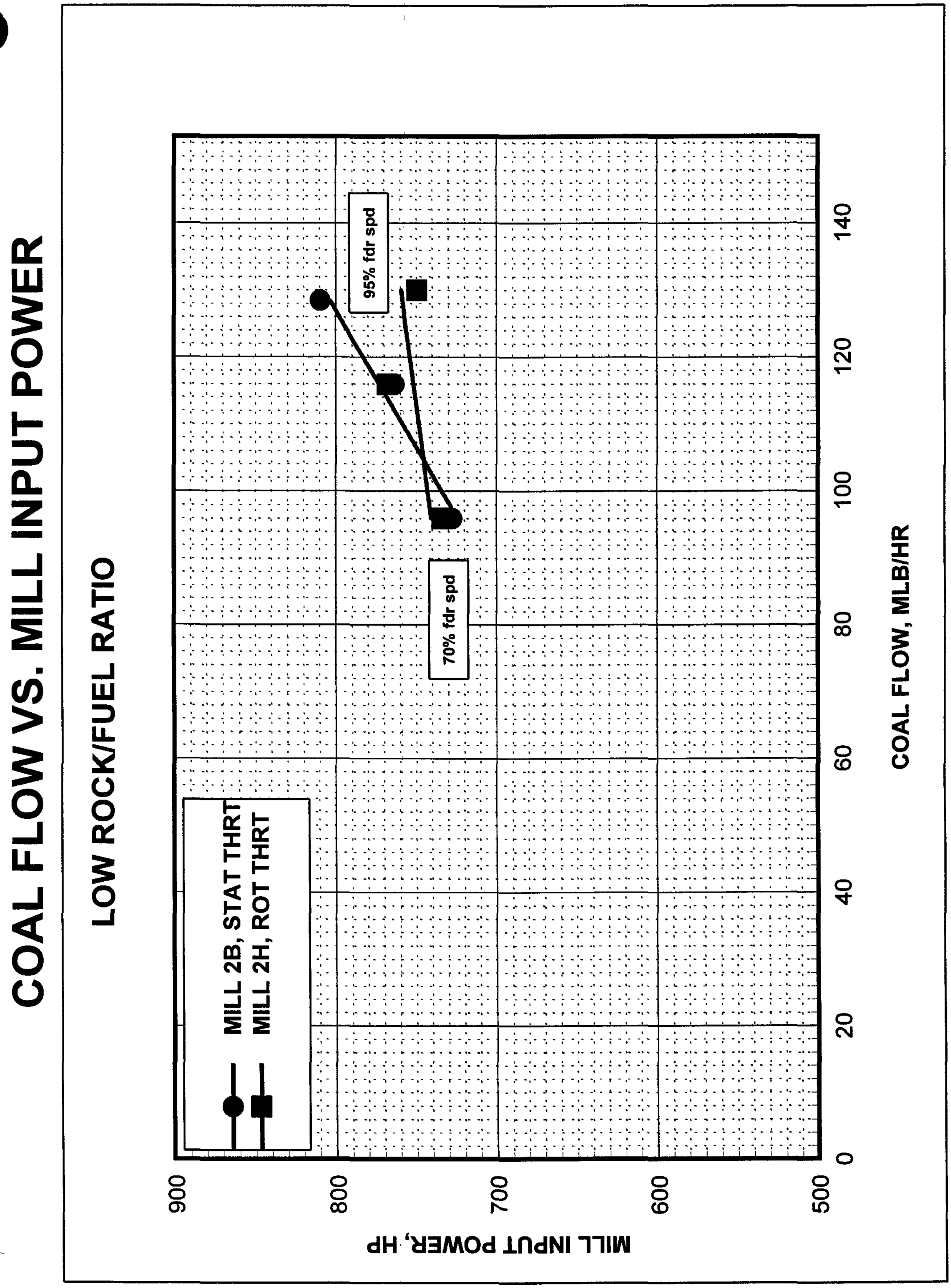


FIGURE 2-22

IP7_0387 63

MOTRINFO May 21, 1998 2:48:08 PM

FIGURE 2-23

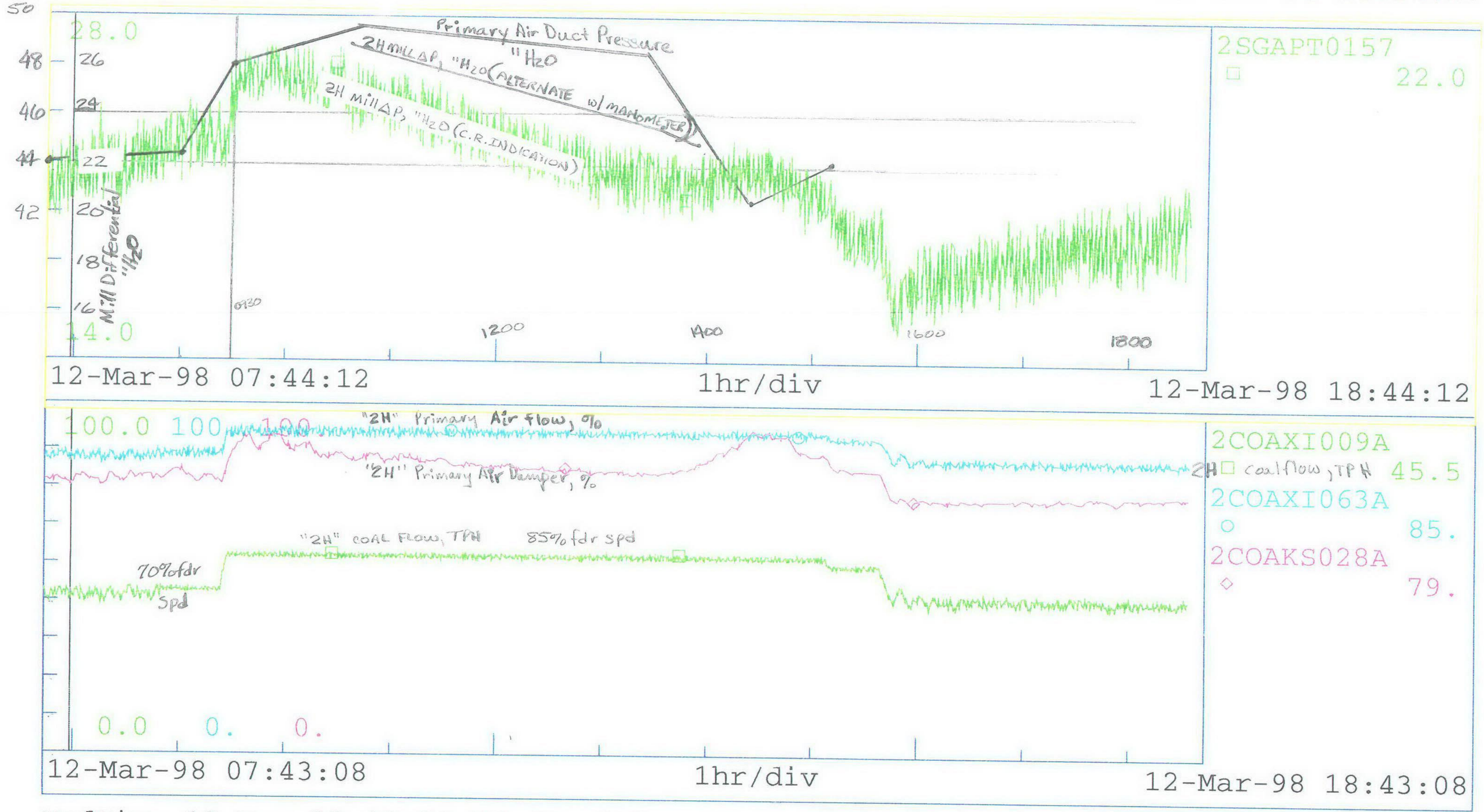


CFVSPOWR June 3, 1998 1:20:45 PM

MILL 2H PERFORMANCE WITH BAD COAL : 3/12/98

Printed out for: PHONG-D - 12-Mar-98 18:34:17

100 Messages PULV PERF PULVERIZER PERFORMANCE 12-Mar-98 18:34:17



EndTim= 12-Mar-98 18:34:17 /EvalTim= 12-Mar-98 07:58:23 /PanRate= 0

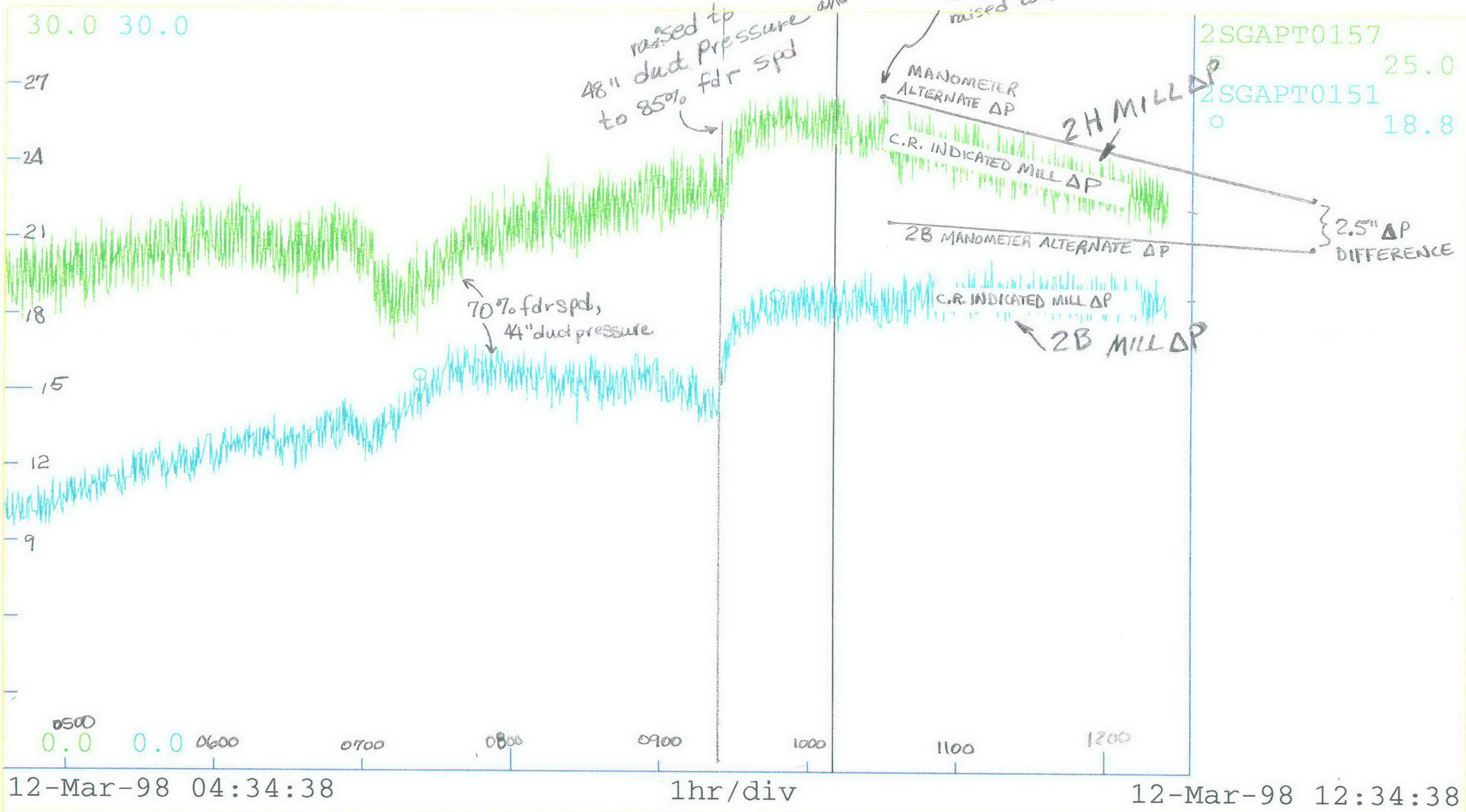
Figure 3-1

IP7_038765

2B, 2H MILL DIFFERENTIAL (CONTROL ROOM VS. ALTERNATE w/ MANOMETER)

Printed out for: PHONG-D - 12-Mar-98 12:24:55

100 Messages 2SGAG08 FUEL 12-Mar-98 12:24:55



12-Mar-98 04:34:38 1hr/div 12-Mar-98 12:34:38

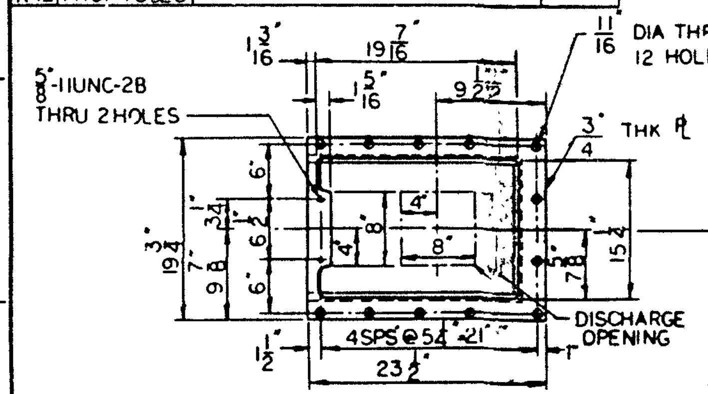
EndTim= 12-Mar-98 12:24:55 /EvalTim= 12-Mar-98 10:10:19 /PanRate= 0

Figure 3-2

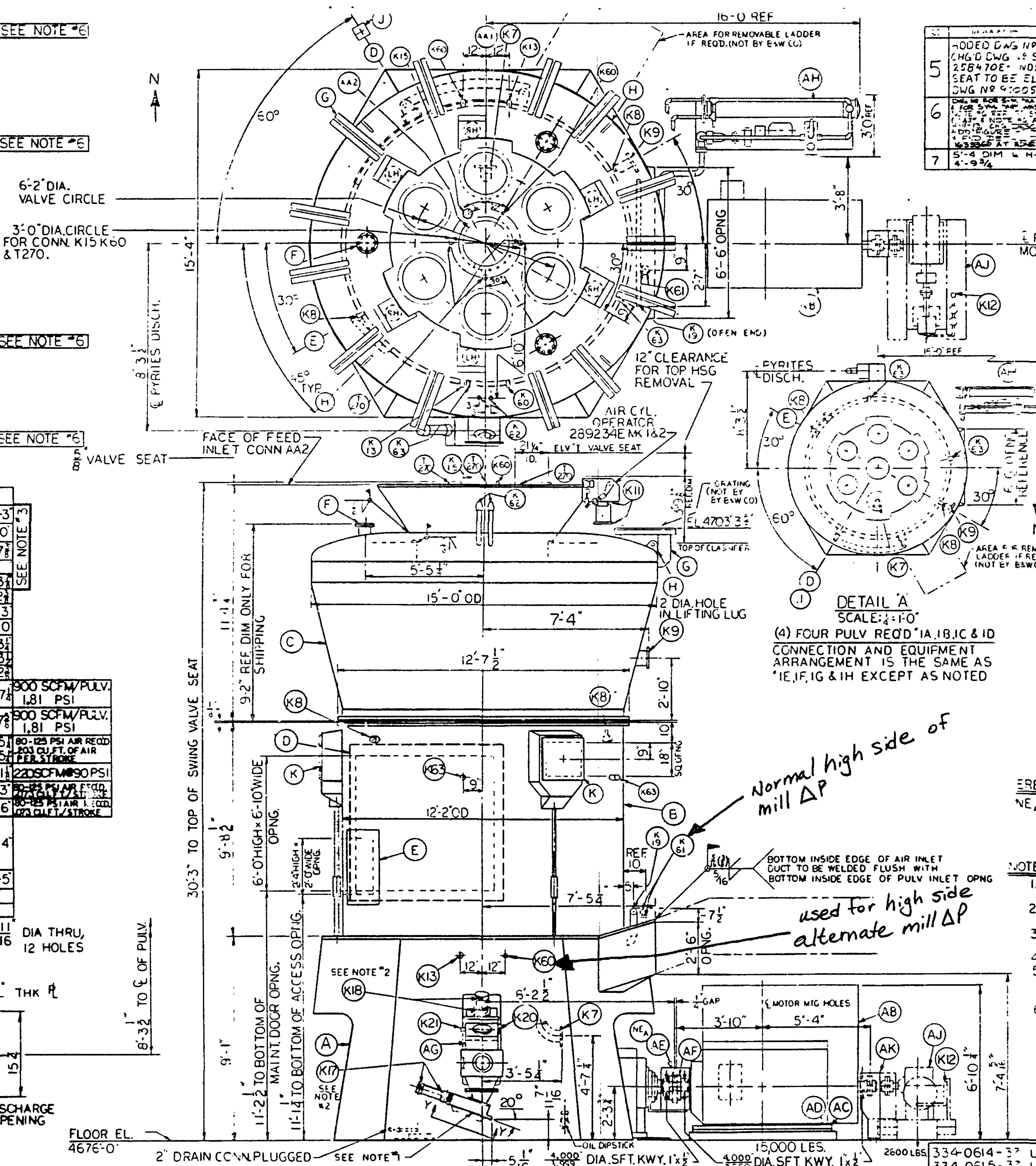
SYM	REFERENCE PARTS	
A	BOTTOM HOUSING	SEE NOTE #6
B	INTERMEDIATE HOUSING	
C	TOP HOUSING	
D	MAINTENANCE DOOR	
E	ACCESS DOOR	
F	ACCESS FOR LIFTING MECHANISM	
G	PLATFORM SUPPORT 288965E	
H	LIFTING LUGS 4 REQD EQ SPACED	
J	ROLL WHEEL REMOVAL ASS'Y 40549194E	SEE NOTE #6
K	LOADING CABLE ACCESS DOOR	

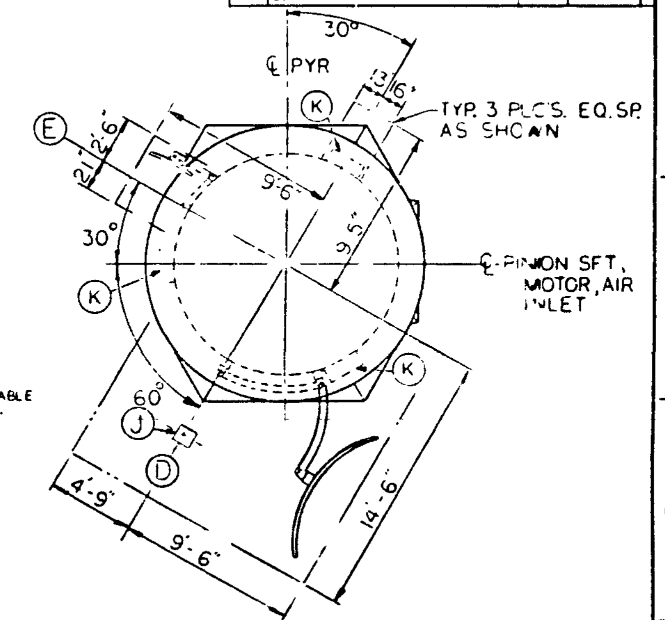
SYM	AUXILIARIES	
AA_1	22" SWING VALVE 6 DISCH. 3/4-10 UNC-2B 20 HOLES EQ. SP. STR ¢ ON 27 1/2" B.C. W/AIR CYLINDER OPER. ASS'Y. 409467E	
AA_2	23 1/4 I.D. INLET FOR 18" O.D. COAL INLET PIPE 3/4-10 UNC-2B 20 HOLES EQ. SP. STR ¢ ON 26 1/2" B.C.	
AB	MOTOR, SIEMENS-ALLIS, 6600V. 3PH. 60 Hz. 800 HP. 900 RPM. FRAME 6811. TYPE RAZ	
AC	2" MOTOR SOLE PLATE	SEE NOTE #6
AD	MOTOR SHIMS IF REQ'D	
AE	COUPLING GUARD 288920E	
AF	COUPLING-FALK STEEL FLEX- T20 SIZE 140 W/LIMITED END FLOAT	
AG	PYRITES BOX & GATE ASS'Y	
AH	LUBE OIL 8328J & 249307E	
AJ	INCHING DRIVE ASSEMBLY 289279E MK-1	SEE NOTE #6
AK	INCHING DRIVE COUPLING GUARD 174264C	
☒	DENOTES NOT BY B & W CO.	

SYM	CONNECTIONS			EL.	
K13	2-1" (NPT MALE) CAPPED	FOR INERTING WITH CO₂, N₂ OR STEAM		4684-3"	SEE NOTE #3
K8	2-1" (NPT MALE) CAPPED			4694-0"	
K15	1-1 1/4" 150# FLANGE W/BLIND FLG.	CO MONITORING IF REQUIRED		4706-7 5/8"	
K19	1-3 1/2" (BUTTWELD) INERTING HEADER			4686-3"	
K60	1-1/4 TEST PRESS CONN. (PLUGGED)			4706-2"	
	2-1/4 TEST PRESS CONN. (PLUGGED)			4684-3"	
K61	2-1/2" (NPT FEMALE) WINDBOX STATIC PRESS	K61 VERSUS K62 = PULV ΔP	K61 VERSUS SEAL AIR TAP SEAL AIR/PRI AIR ΔP	4686-0"	
K62	2-1/2" (NPT FEMALE) CLASSIFIER STATIC PRESS			4704-3 1/4"	
K63	2-1/4" TEST PRESS CONNS (PLUGGED)			4692-3 1/2"	
270	3-2" (NPT FEMALE) PLUGGED FOR THERMOWELLS			4706-2"	
K7	6 I.D. × 11 O.D. FLG 3/4-10 UNC-2B 8 HOLES EQ. SP. STR ¢ ON 9 1/2" BC YOKE AIR SEAL CONNECTION CONNECT TO AIR SEAL BLOWER			4680-7 1/4"	900 SCFM/PULV. 1.81 PSI
K9	6" (150# FLG CONN) ROLL WHEEL AIR SEAL (CONNECT TO AIR SEAL BLOWER)			4697-7 5/8"	900 SCFM/PULV. 1.81 PSI
K11	12-3/8" (NPT FEMALE) INLET CONNS ONE/AIR FLOW CONTROL VALVE			4704-5" 4705-5"	80-125 PSI AIR REQD .203 CU. FT. OF AIR PER STROKE
K12	1-1" QUICK DISCONNECT COUPLING W/DUST PLUG INLET CONN INCHING DRIVE			4678-1 1/2"	220 SCFM @ 90 PSI
K17	2-1/2" (NPT FEMALE) PYRITES AIR CYL.			4678-3"	80-125 PSI AIR REQD .073 CU. FT./STROKE
K18	2-1/2" (NPT FEMALE) PYRITES AIR CYL.			4682-6"	80-125 PSI AIR REQD .073 CU. FT./STROKE
K20	1-1/2" (NPT FEMALE) FOR CUSTOMER'S LEVEL INDICATOR			4680-4"	
K21	1-1/2" (NPT MALE) WINDOW SPRAY CONN. (WATER OR AIR)			4680-5"	
K41	PITOT TUBES	SEE P.C. ARRGT'S			
K42	PITOT TUBES				



VIEW Y-Y
SHOWING PYRITES OUTLET
SCALE: 1 1/2" = 1'-0"





MAINTENANCE & ACCESS DOOR CLEARANCE
TYP. FOR ALL PULVERIZERS
SCALE: 1/4" = 1'-0"

(4) FOUR PULVERIZERS REQ'D AS SHOWN 'IE, IF, IG & IH
(4) FOUR PULVERIZERS 'IA, IB, IC & ID REQ'D AS SHOWN IN DETAIL 'A' THIS DWG.
FOR TRUE RADIAL DIMENSIONS SEE PLAN VIEW TOTAL EST. WT. 145 TONS

ERECTION NOTE
NE. ERECTOR TO RE-TORQUE GEARBOX HIGH SPEED BEARING CARTRIDGE BOLTS PER TORQUE VALUE CHART IN ERECTION INSTRUCTIONS, AFTER INSTALLING COUPLING GUARD.

NOTE:
1. CUSTOMERS CONNECTION TO PYRITES BOX TO BE SELF DRAINING
2. A MIN. OF 3/4" DIA. TUBING SHALL BE USED BETWEEN PYRITES GATE CYLINDER AND SOLENOID VALVE MAX 20' LG.
3. RECOMMENDATIONS FOR INERTING AND CLEARING REFERENCE B&W GUIDE SPECIFICATIONS IA5-6R21-29Y.
4. TOTAL OF EIGHT (8) PULVERIZERS REQUIRED PER UNIT.
5. CUSTOMER TAG NUMBERS, PULVERIZER IDENTIFICATION 'IA' THRU 'IH' IS PREFIXED BY XSGA-PLV-__ WHERE 'X' IS THE ASSOCIATED UNIT NUMBER 1 THRU 4.
6. SEE FOUNDATION DETAIL DRAWING REFERENCE, DWG 163336D (RB-614).

INTERMOUNTAIN POWER PROJECT
STEAM GENERATOR UNITS 1,2,3 & 4
PROJECT FILE 9255.62.3401
IPA CONTRACT 2010N
FIGURE 4

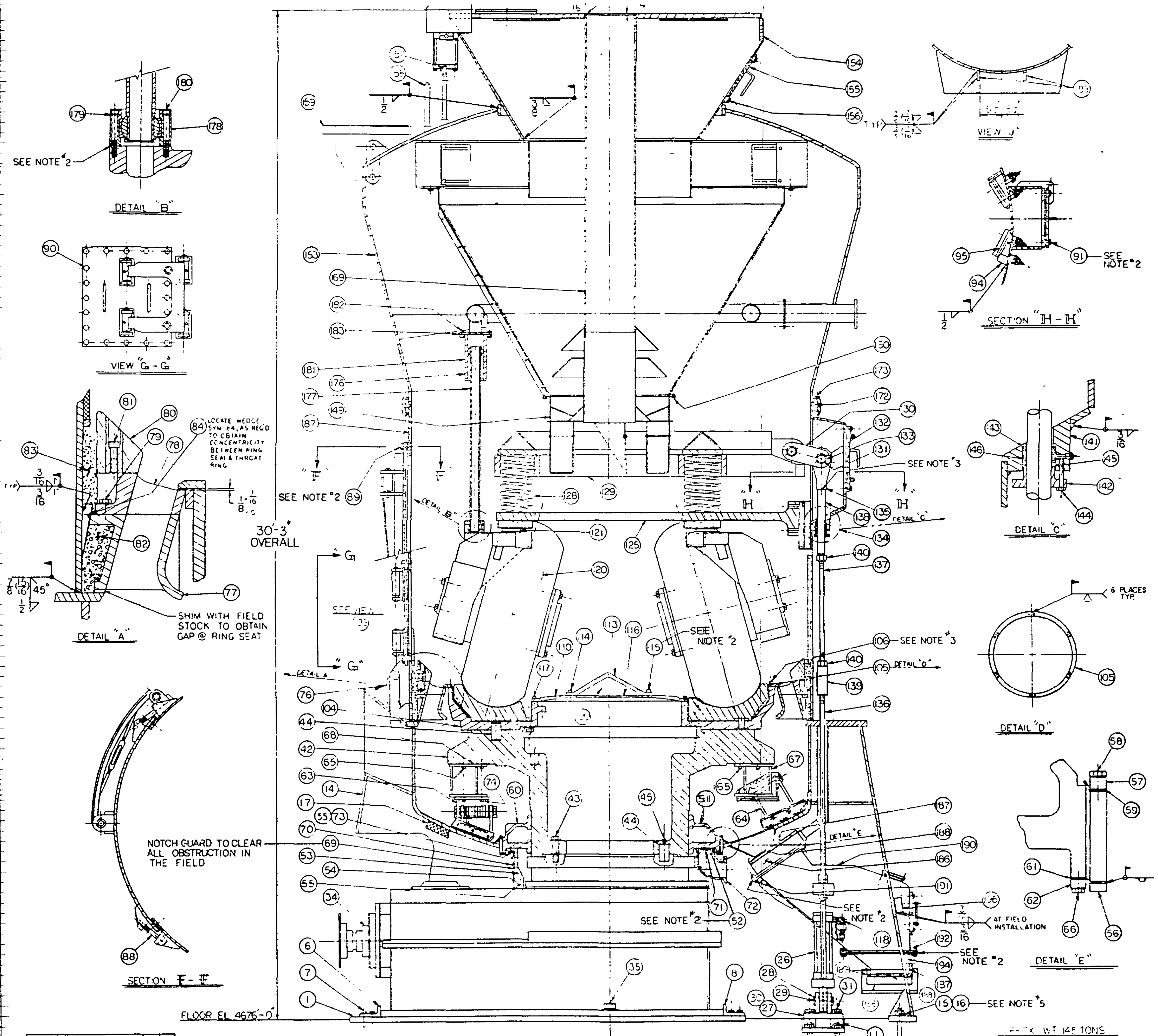
FIGURE 4-1

334-0614-37	UNIT	1
334-0615-37	UNIT	2
334-0616-37	UNIT	3
334-0617-37	UNIT	4

DRAWN BY C. JONES
RB-614, RB-615, RB-616, RB-617
OUTLINE
MPS-89G
PULVERIZER
68 TON CAPACITY.
SCALE 1/2" = 1'-0"
THE BABCOCK & WILCOX CO.
288930E 7

REVISIONS
1	[illegible]		CJ/NK
2	ADDED MOTOR INCHING DRIVE [illegible]		CJ/NK
3	[illegible]		CJ/NK
4	[illegible]		CJ/NK
5	ADDED DWG NO TO SYM 'J'. CHG'D DWG NO SYM 'AA1' FROM 258470E. INDICATED VALVE SEAT TO BE ELV. ¢ DELETED DWG NO 410058 @ ZONE D-7		CJ/NK
6	[illegible]		CL/NK
7	5'-4 DIM @ H-9 WAS 4'-9 3/4		TDC/JM RN-2792

	159716D	
	138882B	
SOC. HD. CAP SCR.		
	177479C	9CC
	152329D	79
	146200B	166
W/LOCK WASH.		
W/ LOCK WASH.		
	146177B	
SCR W/ LOCKWASHER		
LATIO	281064E	
	219380E	21.93
	95736A	3
MBLY	289289E	
	95735A	
	179681E	7.4
	93656B	
	99876A	
ING PL		
E "A"		
	159707D	
	130207B	
	177009B	
	177008B	
	177007B	
	177017B	
	140326A	
	146111B	
A.W. CHESTERTON STYLE 1724		CEQ
LG. HEX HD. CAP SCR.		
	100301A	
	140327A	
SEMBLY	159727D	
HD. CAP SCR. W/LW,PLN PLWSH-PUT		
Y	249345E	2730
	409467E	
	146126B	
SP SCR. W/LOCK WASH.		
	161806E	
	161806E	
	288965E	
PE 304 SST X 9'-6" LG.		
IN. X 1/4 X 4'-0" LG.		
R. W/NUT LOCK WASH. (A-325)		
ASSEMBLY	145989D	
(MK-1)	130292B	
	129307C	
	84390B	
P SCR. W/H COLLAR HELICAL SPRING		
	166665B	
BOLT W/H T & LOCK WASH.		
1/4 THK. "ARLOCK"-THERMO-SIL		
LY	289225E	
HD. CAP SCR W/LOCK WASH.		
MK-1	100391A	
Y	281080E	
HD. CAP SCR. W/LOCK. WASH.		
T W/NUT LOCK WASH.		
	214831E	
NS ALLED		
DRAWINGS		
	DWG Nº	
	288930E	
	288931E	
	163324D	
	163336D	
	288991E	
	412300E	



NOTES:

1) COAT WITH LOCTITE PIPE SEALANT W/ TEFLON.
2) COAT WITH PERMATEX SEALANT.
3) COAT WITH LOCTITE AV-86.
4) PACK WITH DOW CORNING NO. 41 SILICONE GREASE.
5) 1/4 TACK WELD WASHER 2 SIDES TO HOUSING FLANGE.
6) SEE FOUNDATION DETAIL DWG 163336D FOR GEAR DRIVE BASE, CLEVIS FOUNDATION PL, LOADING CYL. CLEVIS PL, ROLL WHEEL REMOVAL ANCHOR PL, INCHING DRIVE BASE PL & BOTTOM HSG FLANGE FIELD ALTERATION DRAWINGS.

ERECTOR:

DO NOT USE THIS DWG. FOR RADIAL LOCATIONS OF CONNECTIONS, ECT. SEE CONTRACT OUTLINE DWG. 288930E FOR ALL RADIAL DIMENSIONS AND LOCATIONS

INTERMOUNTAIN POWER PROJECT
STEAM GENERATOR UNIT #1
PROJECT FILE 1.35.02.340
IPA CONTRACT 20101

FIGURE 4-2a

The Babcock & Wilcox Company

COMPOSITE SECTIONAL ASSEMBLY
MPS-89G PULV.
(68 T.P.H.)
1981 STANDARD

334-0614-37
RB-614
1:12
4445 J 2

4445J 2

IP7_038768

Item	Qty	Qty	Description	Dwg. No.	Wt.
1	1		GEAR BOX BASE PLATE ASSEMBLY	SEE NOTE #	8950
2					
3					
4					
5					
6	3		LOCATING ANGLES (MK-1)	343998	33
7	8		1 1/4-7UNC-2A X 3 LG. HEX HD. CAP SCR. W/LOCK WASH.		
8	1		LOCATING ANGLES (MK-2)	343998	33
9					
10					
11	1		CLEVIS FOUNDATION PLATE	SEE NOTE #6	
12					
13					
14	1		BOTTOM H[illegible] ASSY. SEE NOTE # L.H. 164255D, R.H. 164256D		26580
15	16		PLAIN PLATE WASHER	100363A	
16	16		1 1/2 LOCK WASHER		
17			BOTTOM HSG. INSULATION (DISHED HEAD)	133845A	
18					
19					
20					
21					
22					
23					
24					
25					
26	3		TENSION CYLINDER ASSY	1523040	565
27	1		LOADING CYLINDER CLEVIS	101740B	175
28	3		CYLINDER PIN	95776A	5
29	6		COTTER PIN 3/8 DIA. X 4" LG.		
30	2		LOADING CYLINDER CLEVIS	SEE NOTE #6	
31	4		2-4 1/2UNC-2A X 5 LG. HEX HD. CAP SCR. (GR-5) W/LOCK WASH.		
32					
33					
34	1		GEAR DRIVE	4493J	52,000
35	11		2-4 1/2UNC-2A X 5 1/2 LG. HEX HD. CAP SCR. (GR-5) W/LOCK WASH & PLAIN WASH		
36					
37					
38					
39					
40					
41					
42	1		YOKE (MK-1)	249335E	20,[illegible]
43	6		2-[illegible]UN-2A X 8 LG. HEX HD. CAP SCR. W/LOCK WASH.		
44	3		YOKE DOWEL	95739A	
45	2		1-8UNC-2A X 2 1/2 LG. HEX HD. CAP SCR. W/LOCK WASH.		
46					
47					
48					
49					
50					
51	1		PLOW & YOKE AIR SEAL ASSY.	298278E	2,500
52		4	5/8-11UNC-2A X 2 1/2 LG. SOC. HD. CAP SCR. W/LOCK WASH		
53		4	YOKE SEAL SUPPORT [illegible]		93
54		12	5/8-11UNC-2A X 2 LG. HEX HD. CAP SCR. W/LOCK WASH.		
55		12	DOWEL 1/2 DIA. X 2 LG. (HK PULL DOWEL IS OP. E[illegible] (13MM DIA. X 51MM LG.)		
56		1	OUTER CLAMPING RING	189554C	35
57		1	TOP CLAMPING RING	169853C	53
58		36	1/2-13UNC-2A X 1 1/2 LG. HEX HD. CAP SCR. W/LOCK WASH.		
59		12	UPPER AIR SEGMENT	189557C	
60		1	YOKE SEAL	289226E	2,085
61		12	LOWER AIR SEAL SEGMENT	189653C	
62		1	INNER CLAMPING RING	189655C	26
63		1	PYRITES PLOW	145401C	172
64		1	PYRITES PLOW	1496540	205
65		8	1 1/4-7UNC-2A X 3 LG. SOC. HD. CAP SCR. W/LOCK WASH.		
66		24	3/8-16UNC-2A X 3/4 LG. HEX. HD. CAP SCR. W/LOCK WASH.		
67		2	PLOW SPACER	146134B	142
68		2	PLOW SHIMS	166674B	26
69		4	GUARD AT AIR SEAL SUPPORT	130228B	5
70		16	3/8-16UNC-2A X 3/4 LG. HEX HD. CAP SCR. W/LOCK WASH. & PLAIN WASH.		
71		1	GASKET	130214B	
72		1	AIR SEAL CONNECTOR	126296D	50
73		8	5/8-11UNC-2A X 2 1/2 LG. HEX HD. CAP SCR. W/LOCK WASH.		
74		12	1 1/4-7UNC-2A X 2 1/2 LG. SOC. HD. CAP SCR. W/NUT & LOCK WASH		
75					
76	1		THROAT RING ASSY. (MK-1)	[illegible]E	10,[illegible]
77		1	LOWER THROAT RING (MK-1)	[illegible]E	4 300
78		14	UPPER THROAT RING SEGMENT (MK-1)	1597020	221
79		56	3/4-10UNC-2A X 2 1/4 LG. HEX HD. CAP SCR. W/LOCK WASH. & PLAIN WASH		
80		14	CASTABLE LEDGE COVER SEGMENT	1597030	[illegible]
81		28	3/4-10UNC-2A X 4 1/2 LG. FULL THD. SOC. HD. CAP SCR. W/LOCK WASH.		
82	1900#		KAOCRETE "B"		
83	500#		INSULATION CEMENT HOLMES 1200°F HILCOTE OR EQ.		
84	12		THROAT RING WEDGE	95767A	3
85					
86					
87	1		INTERMEDIATE HSG. ASSY. L.H. 407184E R.H. 407185E		20 400
88		6	1 1/2-6UNC-2A X 10 LG. SOC. HD. CAP SCR. W/PLAIN WASH. TYPE "A" 1.625 X 3.25 X .18		
89		46	1 1/2-6UNC-2A X 3 LG. HEX HD. CAP SCR. W/LOCK WASH. (SAE GR.-5)		
90		20	1-8UNC-2A X 2 1/4 LG. HEX HD. CAP SCR. W/LOCK WASH. (SAE GR.-5)		
91		48	1-8UNC-2A X 2 1/2 LG. HEX HD. CAP SCR. W/LOCK WASH. (SAE GR.-5)		
92					
93					
94		3	TORQUE BAR	90043B	105
95		6	SHIM PACK	95766A	
96					
97					
98					
99					
100					
101					
102					
103			A[illegible] SHEET [illegible]	159850A	

Item	Qty	Qty	Description	Dwg. No.	Wt.
104	1		RING SEAT ASSY.	37[illegible]D	23,265
105		8	RING SEAT SEAL	38882B	40
106		24	3/8-11UNC-2A X 1 1/2 LG. SOC. HD. CAP SCR.		
107					
108					
109	1		RING SEAT COVER ASSY.	77479C	900
110		1	RING SEAT COVER PLATE	52329D	790
111					
112					
113		1	RING SEAT COVER CONE	46200B	166
114		12	1/2-13UNC-3A X 2 1/4 LG. SOC. HD. CAP SCR. W/LOCK WASH.		
115		3	1/2-13UNC-3A X 3/4 LG. SOC. HD. CAP SCR. W/LOCK WASH.		
116		1	GASKET FOR RING SEAT COVER CONE	146177B	
117	24		3/4-10UNC-3A x 2 LG. SOC. HD. CAP SCR. W/LOCK WASHER		
118	1		HYDRAULIC HOSE INSTALLATION	281064E	
119					
120	3		ROLL WHEEL ASSY.	249380E	21,800
121	6		ROLL PIVOT PIN	95736A	37
122					
123					
124					
125	1		PRESSURE FRAME ASSEMBLY	289239E	7600
126					
127					
128	18		SPRINGS	95735A	166
129	1		SPRING FRAME	179E81E	7,400
130	3		PIVOT ARM (MK-2)	93656B	45
131	6		CLEVIS PIN	99876A	15
132	2		1/4 DIA. X 5 1/2 LG. SPRING P		
133	12		2 3/4 PLAIN WASH. TYPE "[illegible]"		
134	3		LOADING ROD & SEAL ASSY.	1597070	
135		3	PULL DOWN EYE ASSY.	130207B	72
136		3	LOADING ROD	177009B	39
137		3	LOADING ROD	177008B	
138		3	LOADING ROD	177007B	54
139		3	LOADING ROD COUPLING	177017B	20
140		6	1 1/2-12UN-2B HEX NUT		
141		3	PACKING ENCLOSURE	140326A	30
142		3	PACKING GLAND	146111B	7
143		9	ROD PACKING 1/2 SQ. X 4 [illegible] CHESTERTON STYLE 1724 OR EQ		
144		9	1/2-20UNF-2A X 2 1/2 LG. HEX HD. CAP SCR.		
145		3	PACKING RING	100301A	1
146		3	GREASE RING	140327A	1
147					
148					
149	1		DISCHARGE SECTION ASSEMBLY	159727D	875
150	12		1/2-13UNC-2A X 1 1/2 LG. HEX HD. CAP SCR. W/LW, PLN FL WSHR & NUT		
151					
152					
153	1		TOP HOUSING ASSEMBLY	149345E	27,000
154	1		SWING VALVE ASSY	109467E	4520
155		3	INSPECTION DOOR	146126B	130
156		8	5/8-11UNC-2A X 1 3/4 LG. HEX HD. CAP SCR. W/LOCK WASH.		
157			PRESSURE CONN (MK-1)	118068	
158			PRESSURE CONN (MK-2)	618068	
159	1		PLATFORM SUPPORT ARRG'T.	189655E	
160					
161					
162					
163					
164					
165					
166					
167					
168					
169	1		34" STD. WT. STL. PIPE SA 312 TYPE 304 [illegible] LG.		
170					
171					
172	1		GASKET-"GARLOCK"-THERMO-SIL 2 [illegible] -0" LG.		
173	60		1-8UNC-2A X 7 LG. HEX HD. CAP SCR. W/LOCK WASH. (A-325)		
174					
175					
176	3		ROLL WHEEL SEAL AIR ASSEMBLY	145989D	340
177		3	SEAL AIR PIPE (MK-)	10292P	175
178		3	BEARING CASE	129307C	22
179		3	BEARING COVER	84390B	9
180		24	5/8-11UNC-2A X 5 LG. SOC HD. CAP SCR. W/REGULAR HELICAL SPRING L.W.		
181		3	BEARING GUIDE	156665B	106
182	16		3/4-10UNC-2A X 3 LG. HEX HD. BOLT W/NUT & LOCK WASH.		
183	3		GASKET-9 1/4 O.D. X 6 1/4 I.D. X 1/4 THK. "GARLOCK"-THERMO-SIL		
184					
185					
186	2		PYRITES GATE ASSEMBLY	289225E	280
187	24		1/2-13UNC-2A X 1 1/4 LG. HEX HD. CAP SCR. W/LOCK WASH.		
188	2		GASKET (MK-)	100391A	
189	2		1/2-PLAIN WASHER		
190	1		PYRITES BOX ASSEMBLY	28'080E	700
191	14		5/8-11UNC-2A X 2 LG. HEX HD. CAP SCR. W/LOCK. WASH.		
192	12		5/8-11UNC-2A X 2 LG. HEX HD. BOLT W/NUT & LOCK WASH.		
193					
194	1		PYRITES BOX TRANS.	214831E	86
195					
196	2		STL. ANGLE 4 X 4 X 1/4 X 6" LG. (FIELD INSTALL)		
197					

CONTRACT [illegible]	
DESCRIPTION	DWG. NO.
OUTLINE	[illegible]30E
FOUNDATION	[illegible]31E
WELD SCHEDULE	[illegible]24D
FOUNDATION DETAIL DWG REFERENCE	[illegible]36D
AUXILIARY FOUNDATION	[illegible]91E
MOTOR SOLE & ANCHOR BOLT LOCATIONS	[illegible]CCE

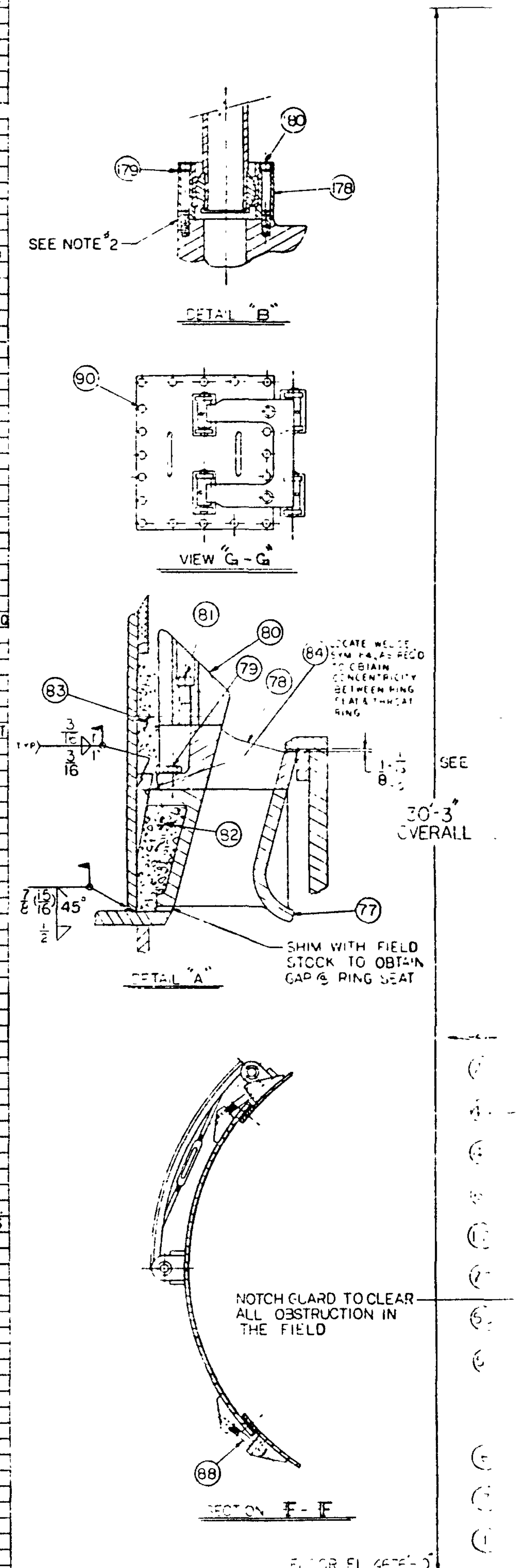


FIGURE 4-2b

IP7_038769

Figure 4-3: 2H Classifier Discharge Door Hanging Open

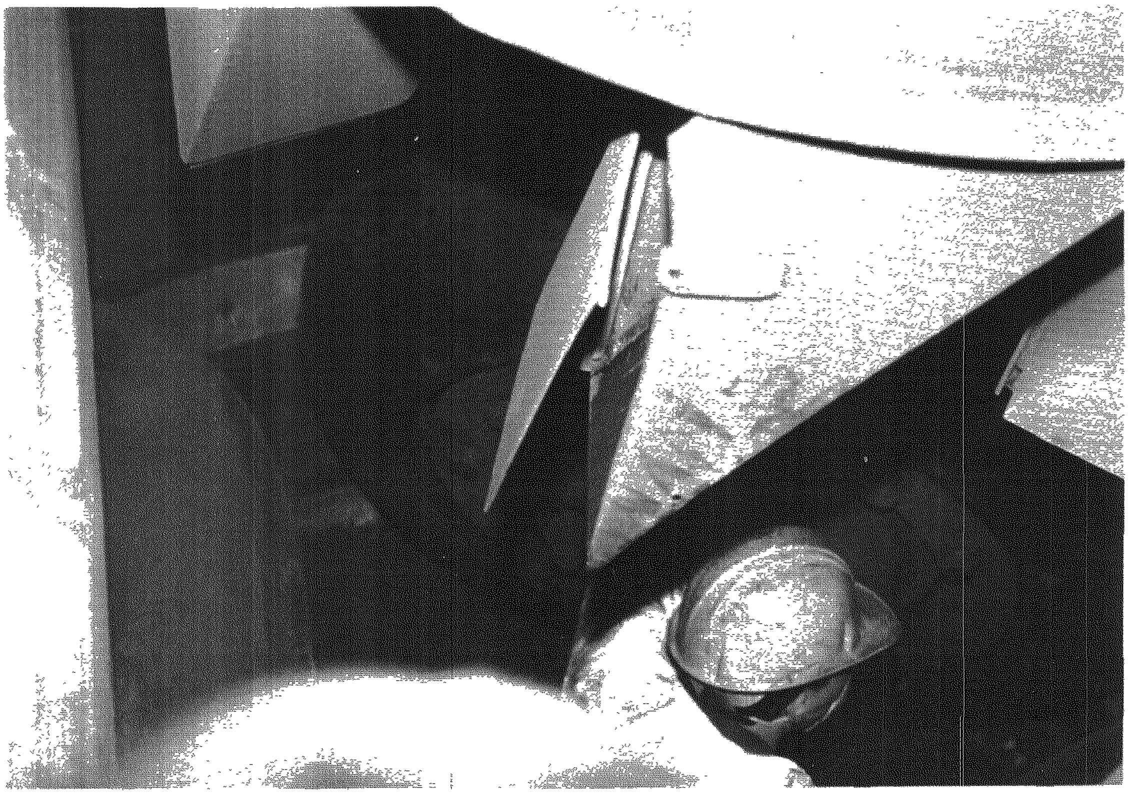


Figure 4-4: 2H Classifier Discharge Door Missing

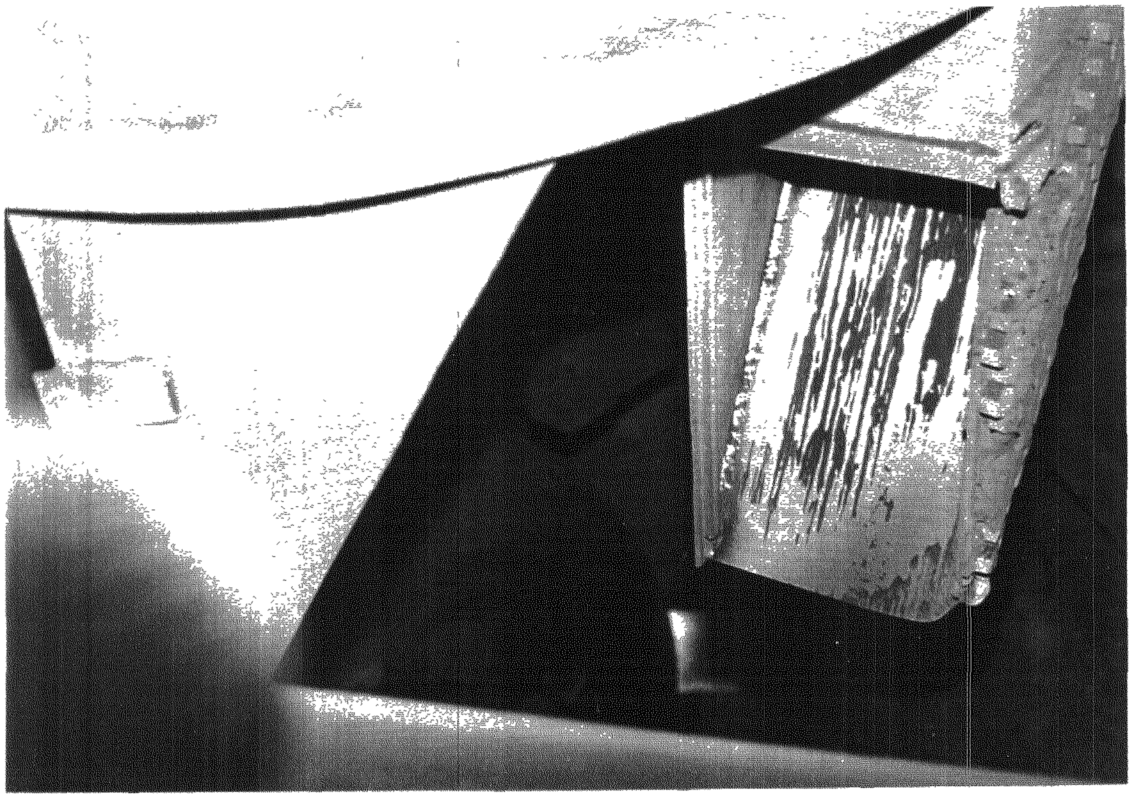


Figure 4-5: Hole in 2H Classifier Discharge Hopper

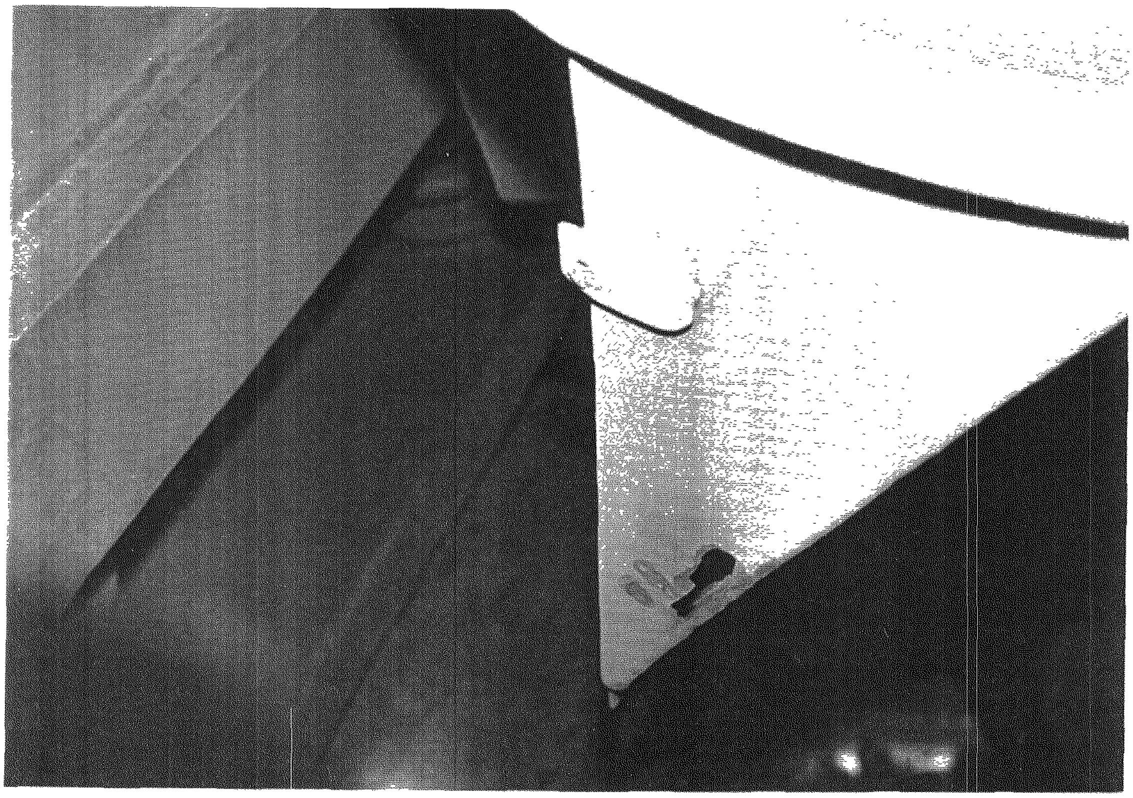


Figure 4-6: 2H Broken Housing Wear Plate

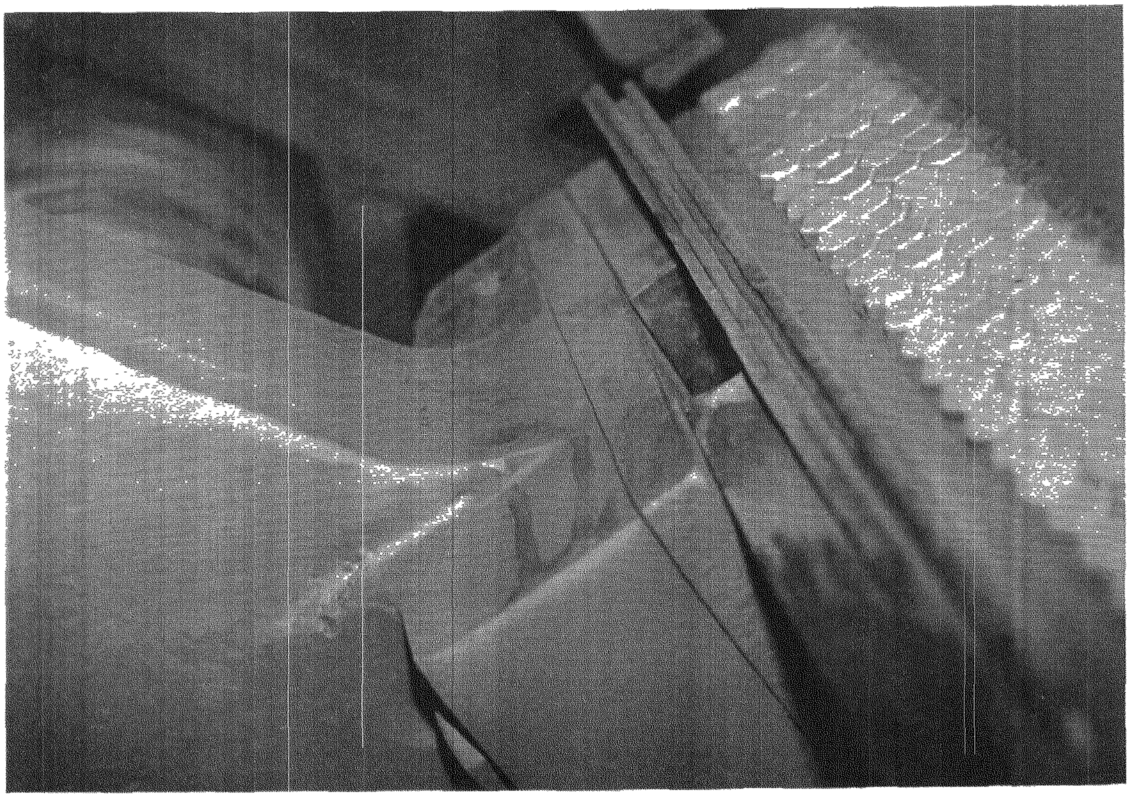


Figure 4-7: Piece of Housing Wear Plate Jammed in Throat Port

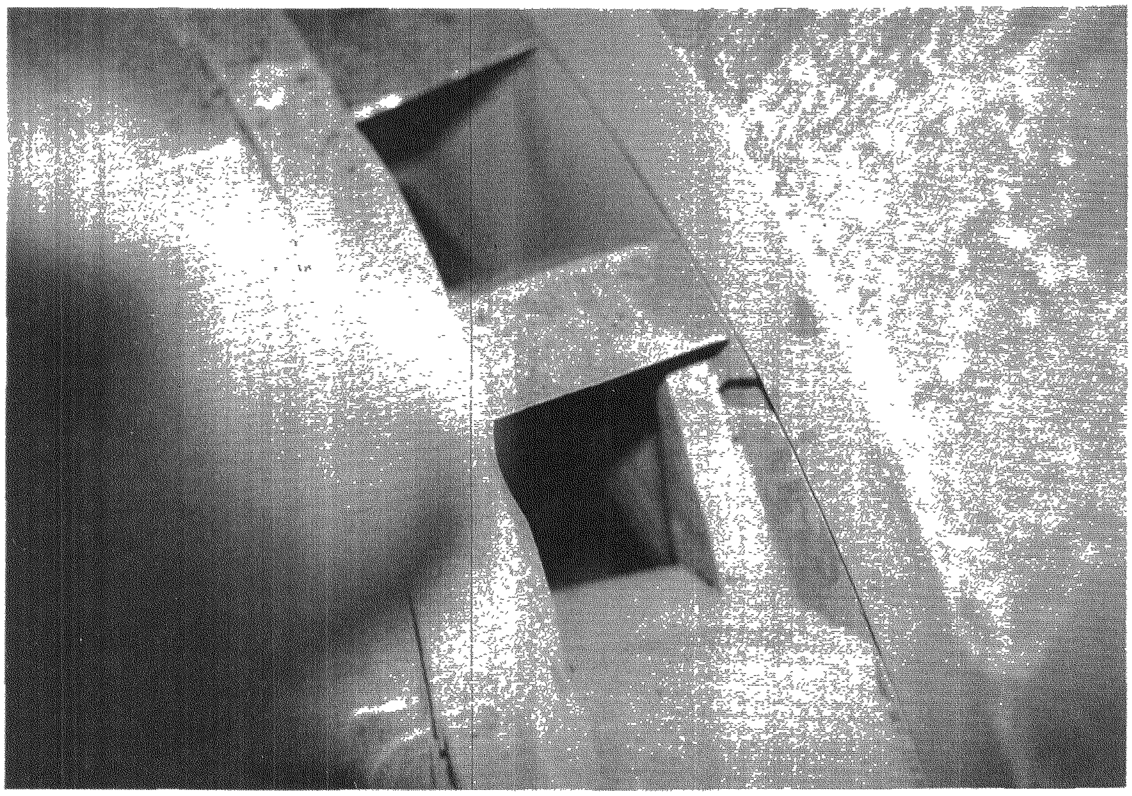


Figure 4-8: 2H Throat After 7 Months' Operation

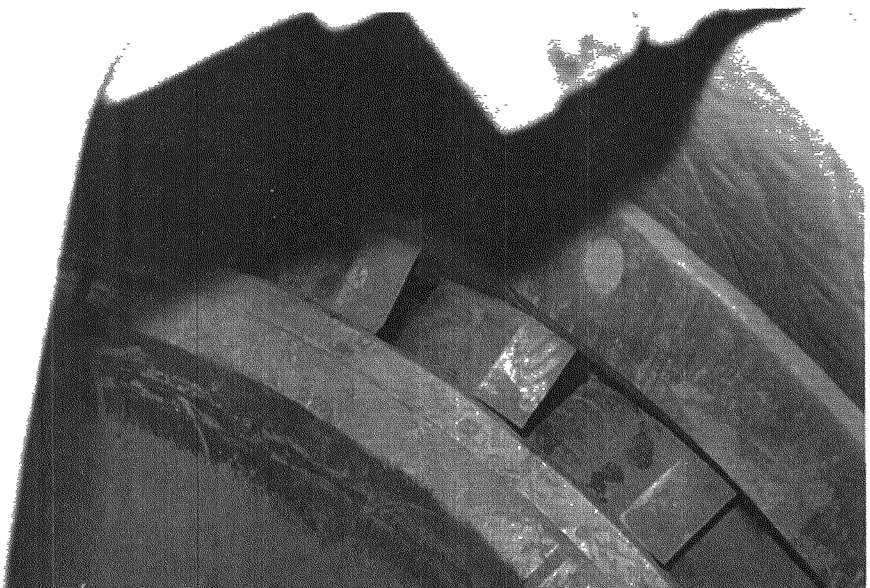


Figure 4-9: 2H Throat After 7 Months' Operation

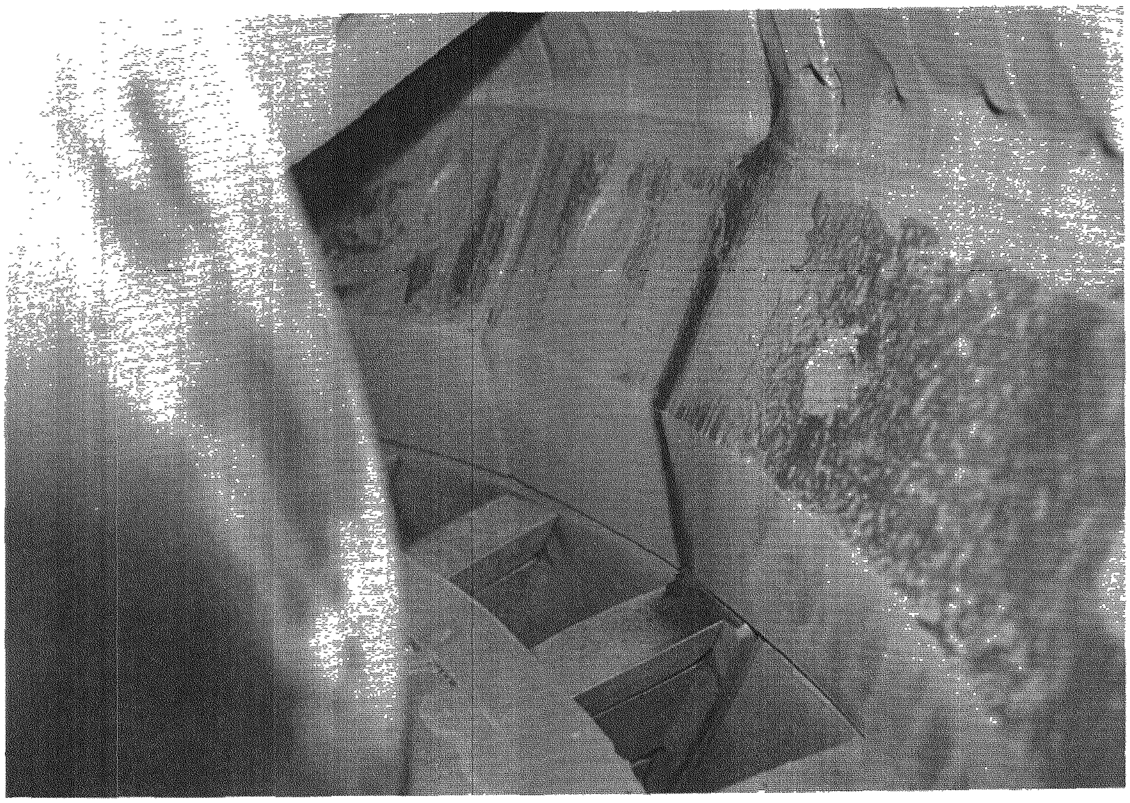


Figure 4-10: 2H Throat After 7 Months' Operation

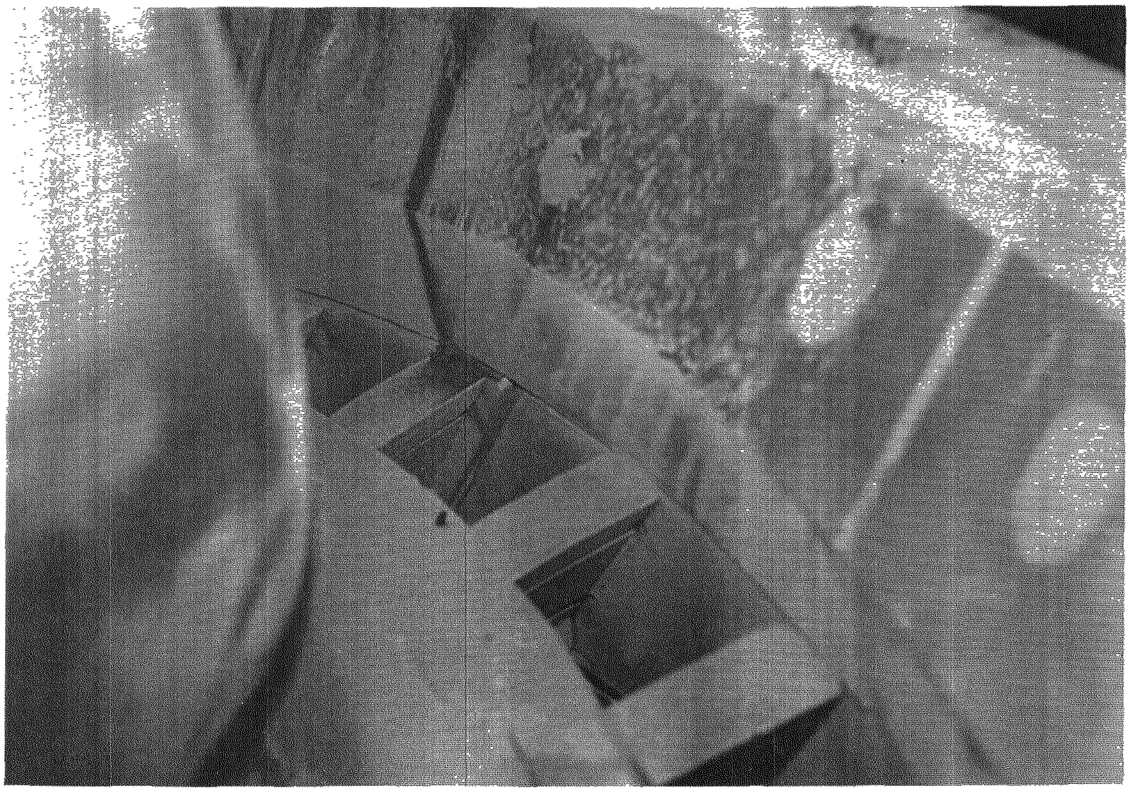


Figure 4-11: Wear on 2H Anti-torque Bars and Spring Frame Lug

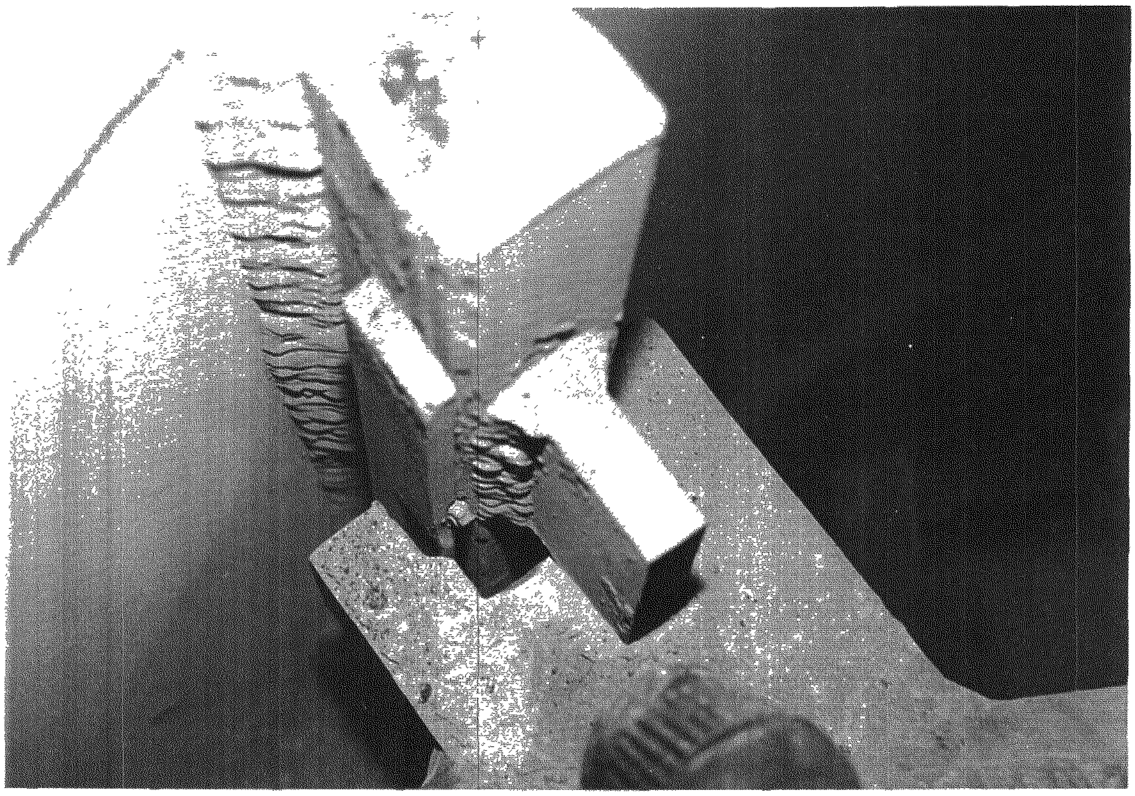


Figure 4-12: Erosion to Classifier Louver Upper Plate at Vane Tips

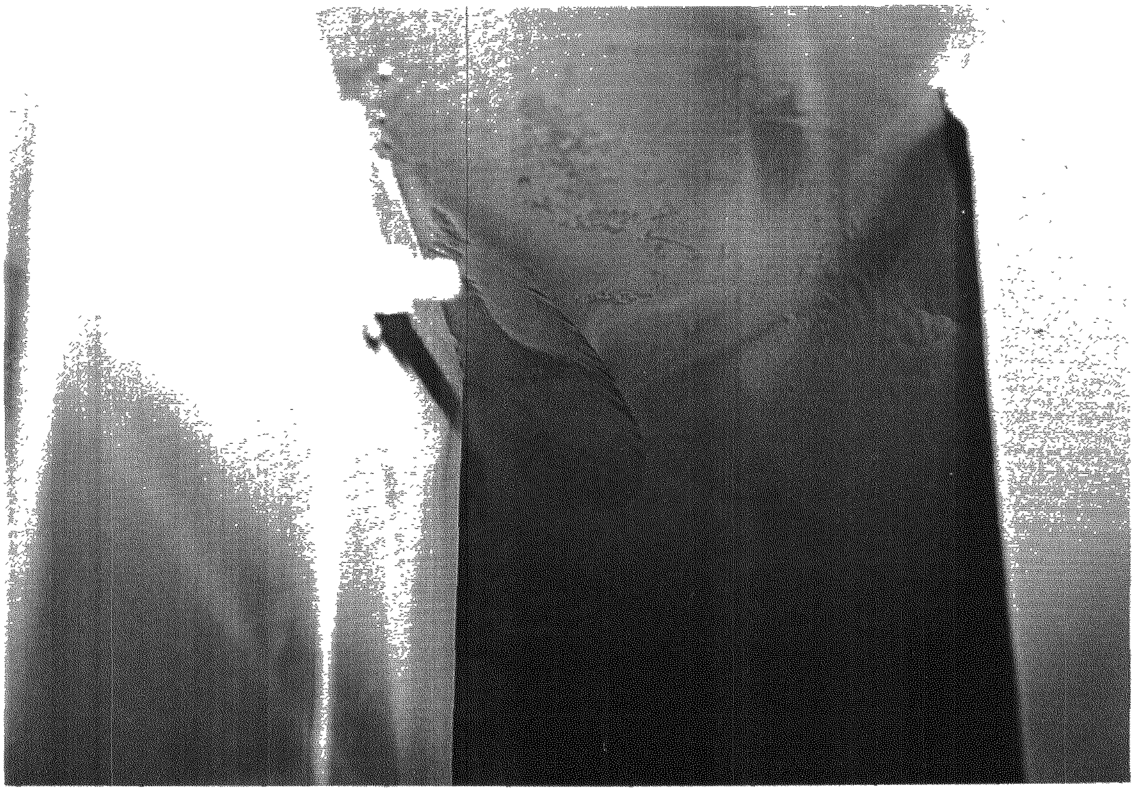


Figure 4-13: Worn 2H Lower Pyrites Plow

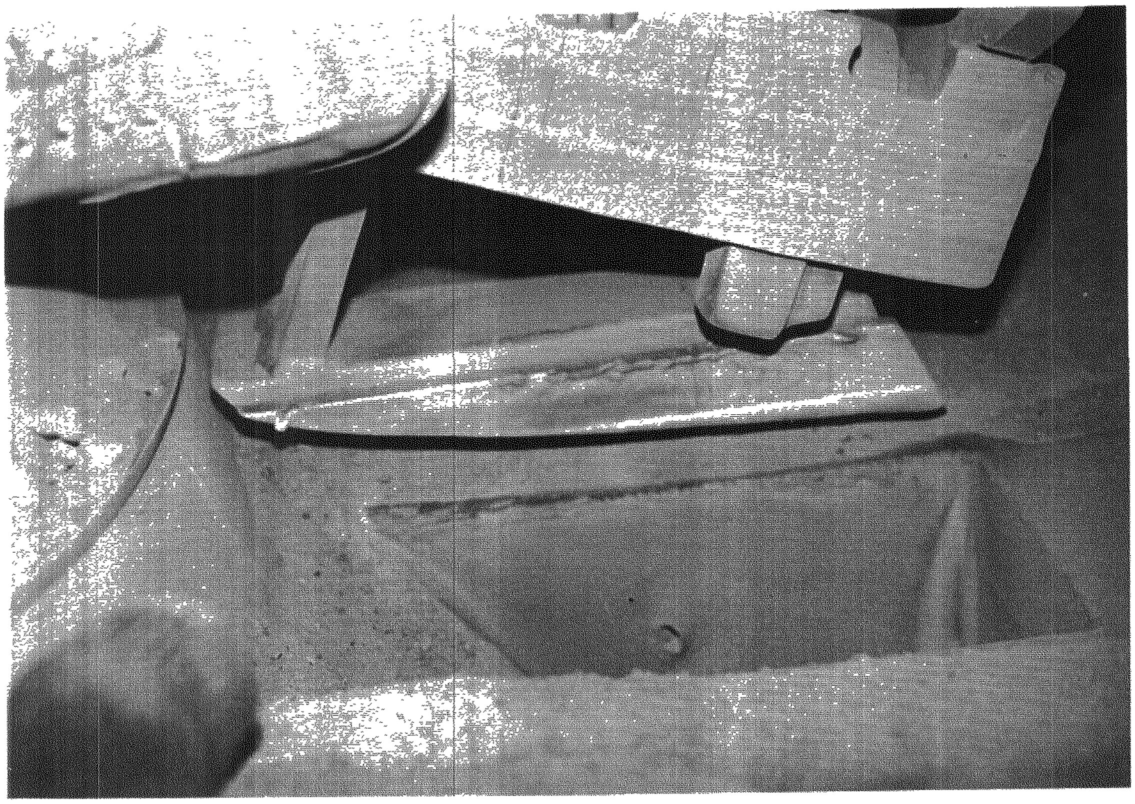
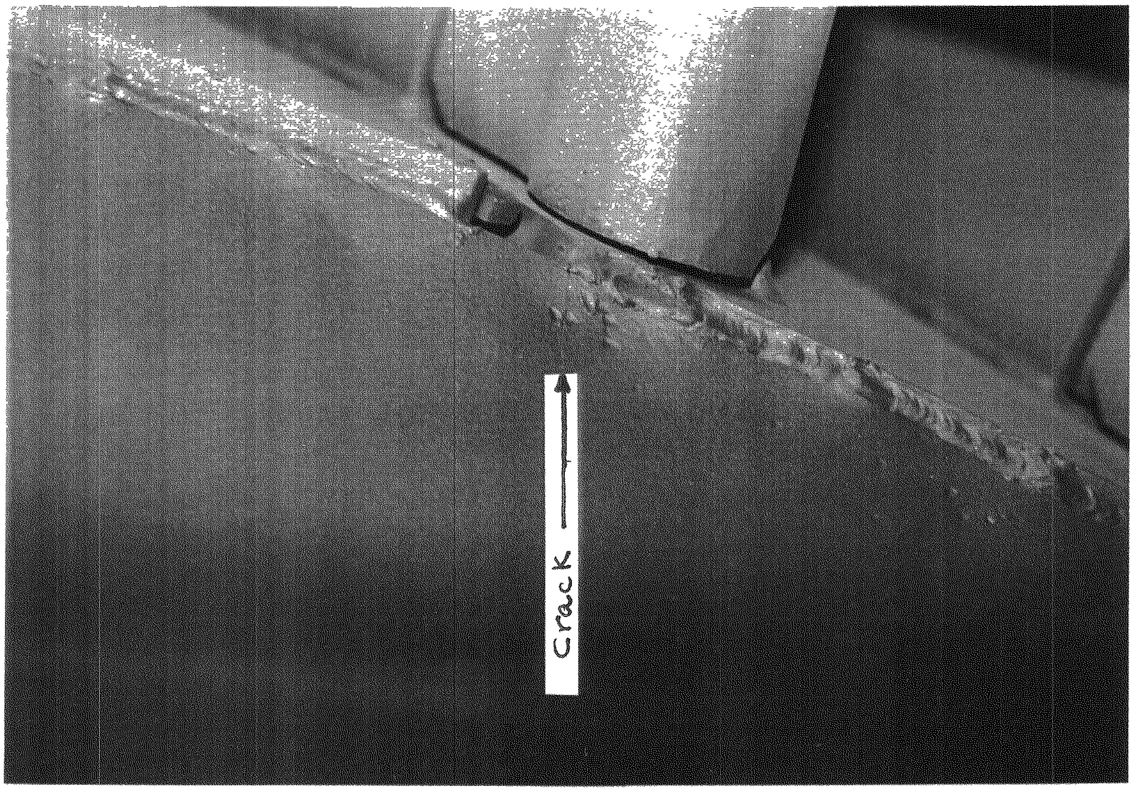


Figure 4-14: 1" Long Vertical Crack in Throat Inner Cone



Unit1 "Bad" Coal Day 3/12/98

Figure 5-1

Printed out for: UNIT1OP - 12-Mar-98 09:41:28
0 Messages PULV STAT PULVERIZER STATUS SHEET- UNITS 1 & 2 12-Mar-98 09:41:28

EndTim= 12-Mar-98 09:41:28 /EvalTim= 12-Mar-98 09:41:28 /PanRate= 0

Unit 1 "Bad" Coal Day 3/12/98

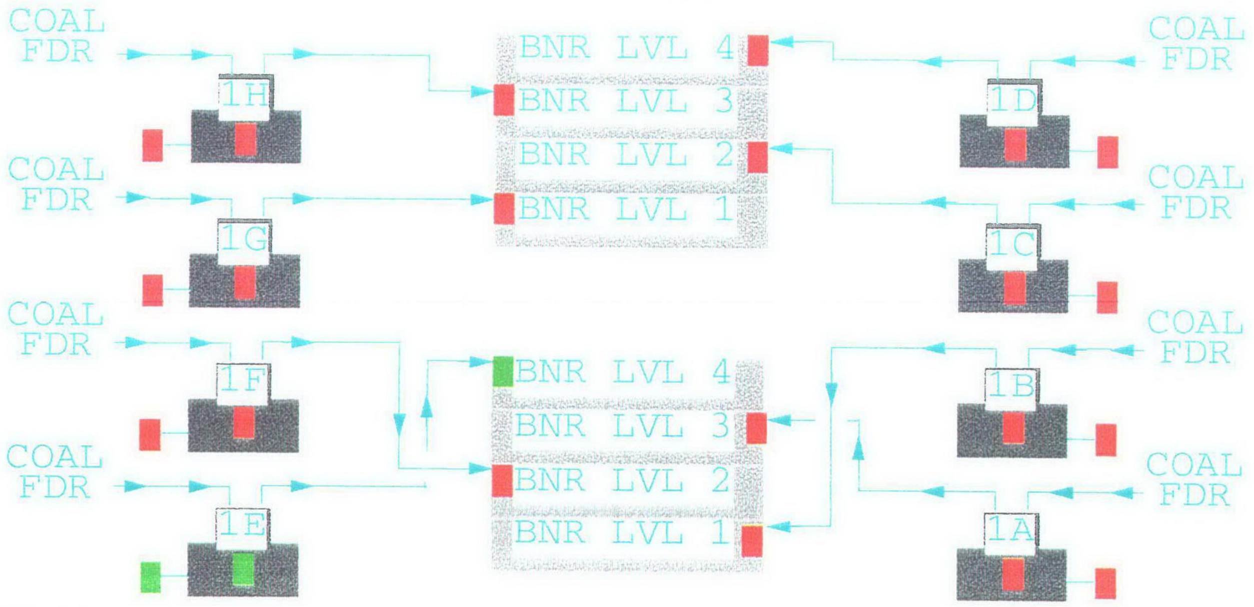
Figure 5-2

Printed out for: PHONG-D - 12-Mar-98 18:14:39
100 Messages 1SGAG08 FUEL

12-Mar-98 18:14:39

UNIT 1

879. MW



TOTAL FUEL
326.7 TPH

<> PRIMARY AIR
<> FUEL OIL
BURNER TEMPS
<> REAR
<> FRONT

	1E	1F	1G	1H		1A	1B	1C	1D
TPH	0.39	47.50	47.60	45.15		47.33	47.69	47.52	47.65
DISCH F	86.3	150.2	147.5	152.1		152.4	151.1	151.3	146.4
INWC	0.1	19.3	21.4	23.1		16.4	16.5	13.7	15.8
AMPS	0.	71.	78.	84.		72.	72.	80.	72.
TMP C	36.	102.	142.	154.		135.	109.	144.	133.

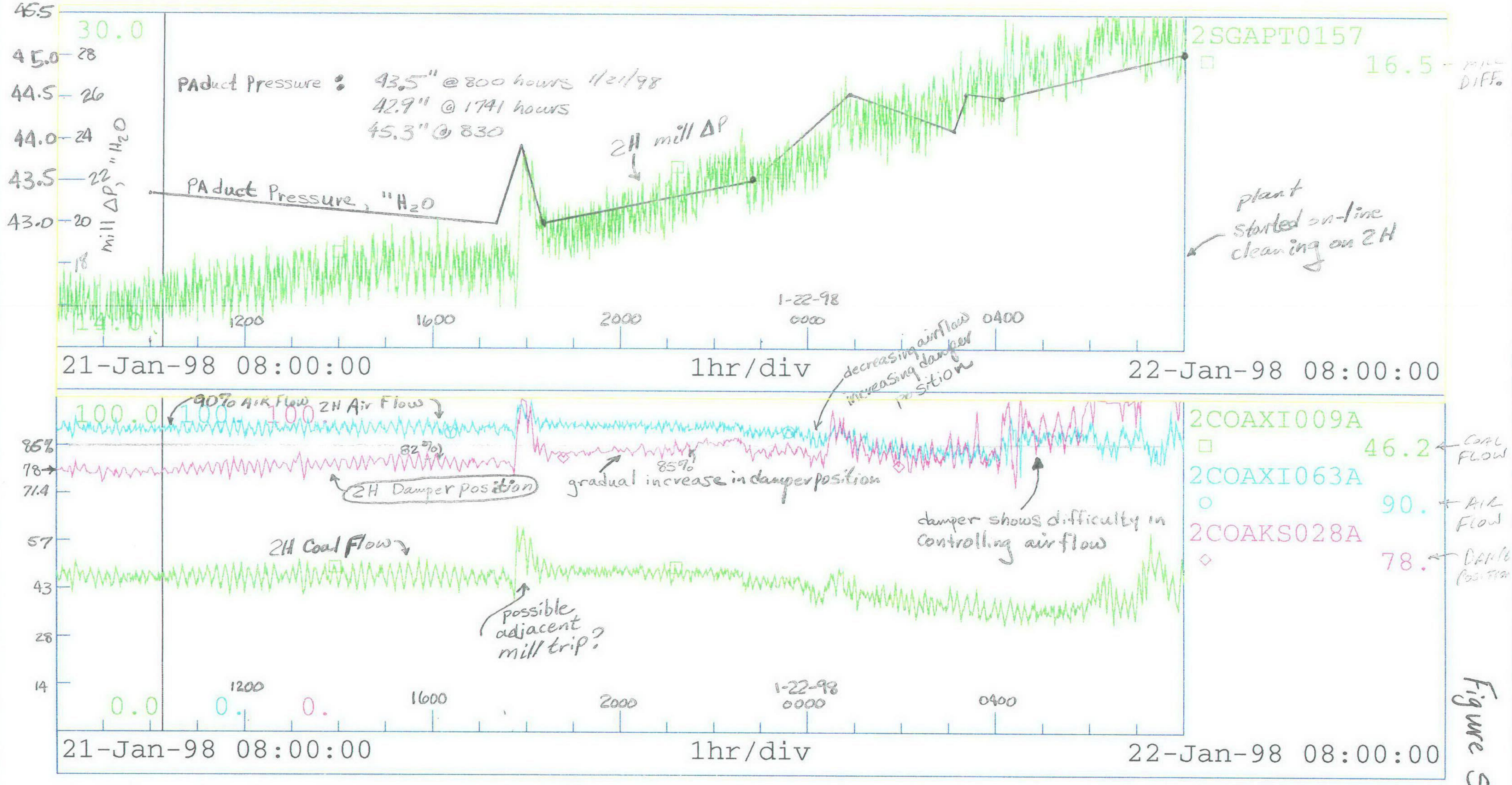
EndTim= 12-Mar-98 18:14:39 /EvalTim= 12-Mar-98 18:14:39 /PanRate= 0

bad coal on one side of unit?

IP7_038777

Figure 5-3 MILL H UNIT #2 Jan. 22, 1998 during high rock/fuel ratio

Printed out for: PHONG-D - 12-Mar-98 17:59:49
100 Messages PULV PERF PULVERIZER PERFORMANCE 12-Mar-98 17:59:49



EndTim= 22-Jan-98 08:00:00 /EvalTim= 21-Jan-98 10:15:18 /PanRate= 0

Figure 5-3